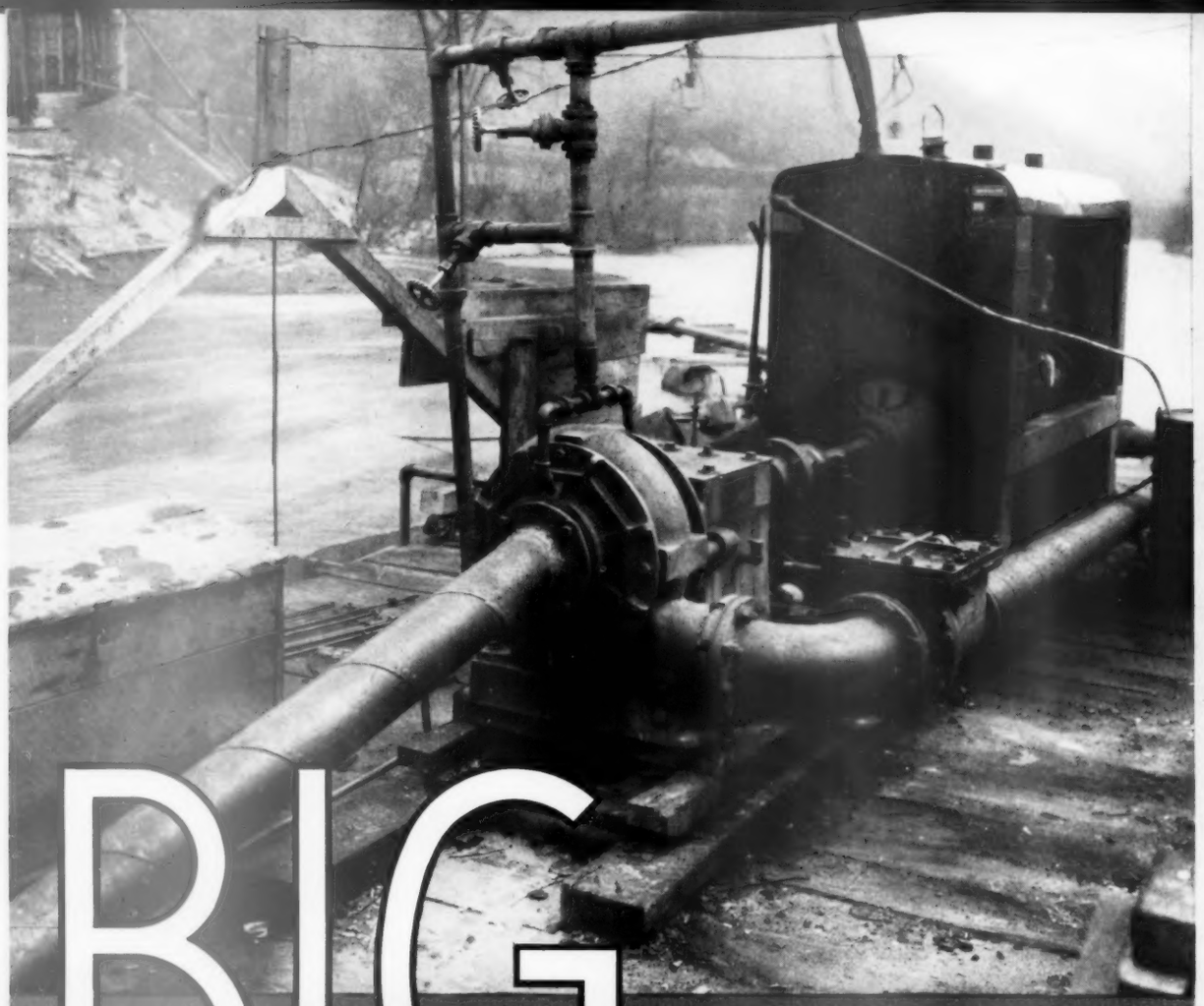
PIT AND QUARRY

NOV 2 1938

NOVEMBER, 1937

Allentown Rebuilds Grinding Departments . . . Tractor-Scraper Operation . . . A Lime Plant in the Montana Hills . . . Ferrari's "Universal Cements" . . . Cutting Costs with the Electric Arc

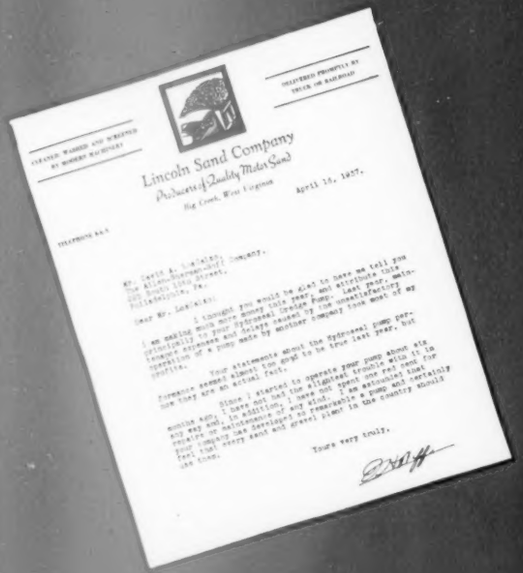
PRINT IN BINDING



BIG RESULTS

with a

LITTLE PUMP



Lincoln Sand Company
Producers of Quality Molding Sand
Big Creek, West Virginia April 16, 1957.

Gentlemen:

Mr. Carl A. Lincoln, President,
The Allen-Sherman-Hoff Company,
223 South 15th Street,
Philadelphia, Pa.

Dear Mr. Lincoln:

I thought you would be glad to hear we tell you how much money this pump has saved us. Last year, material supplied by another vendor for the identical pump operation of a pump made by another company took most of my profits.

Your statements about the Hydroseal pump performance were almost too good to be true last year, but now they are an actual fact.

Since I started to operate your pump about six months ago, I have not had to spend one red cent for repairs or maintenance, and what is more important, I have not had to spend one red cent for fuel. Every cent and dredging pump and certainly the fuel saved is extra profit to the county should be glad to have.

Yours very truly,

About 80 tons per hour are handled by this 6" Hydroseal Dredge Pump, for the 100 ton sand bin on the shore, 500 feet away (elevation 60 feet) is filled in about 1½ hours, yet 10% to 20% of the material pumped must be screened out as oversize . . . A 75 H. P. Diesel was originally thought necessary to drive the pump, but it was later found that the surplus power, made available by the Hydroseal Principle, was adequate for the following:

(1) To generate electricity to drive the cutter head at the pump suction and to supply various electric lights around the plant.

(2) To furnish power for the pump which supplies water to the agitating nozzles at the pump suction.

Address nearest office listed at right for a copy of our catalog No. 836 or any other information.

HYDROSEAL Dredge PUMPS

ASH

HYDROSEAL AND MAXIM
DESIGNS ARE COVERED B
PATENTS AND APPLICATION
IN THE MAJOR MINING CENTE
OF THE WORLD AND CAN B
PURCHASED ONLY THROUG
THE FOL'.OWING COMPAN

•

PHILADELPHIA
MAIN OFFICE
The Allen-Sherman-Hoff C
223 So. 15th Street

ATLANTA
Boiler Equipment Service C
686 Greenwood Ave., N.E.

BOSTON
F. D. Rogers
89 Broad Street

CHICAGO
The Allen-Sherman-Hoff C
407 So. Dearborn Street

CLEVELAND
H. F. Bauer
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DENVER
Shubart & Schloss
520 Boston Bldg.

DETROIT
Coon DeVisser Company
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MULBERRY, FLA.
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846 Baronne Street

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271 Madison Avenue

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Dravo-Doyle Company
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SALT LAKE CITY
The National Equipment C
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The Merrill Company
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Borchert-Ingersoll, Inc.
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ST. LOUIS
Rhodes Equipment Compan
Field Bldg.

WILKES-BARRE
Power Engineering Corp.
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•

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Allen-Sherman-Hoff, Ltd.
602 Colonial Building
11 King Street, West, Toron

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SOUTH AFRICA
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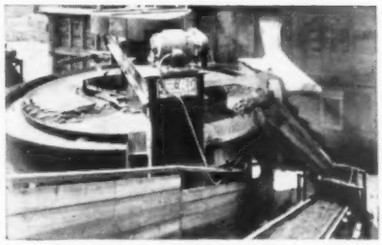
PRINT IN BIND

The Rock Products Industries Everywhere use

LINK-BELT CONVEYORS AND TRANSMISSION EQUIPMENT



Rotoscoop for recovery of fine sand

Belt Conveyor handling sand

● Producers of sand, stone, lime, gravel, gypsum cement and other non-metallic minerals have long known through actual use that Link-Belt cost-reducing mechanical handling equipment and driving machinery are durable, dependable, and economical, being built to last, and to operate at maximum efficiency. Send for General Catalog No. 700.

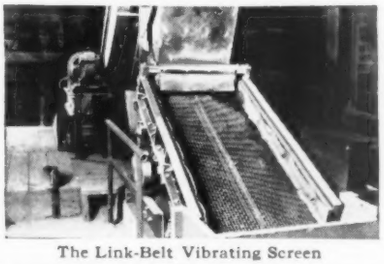
Link-Belt Company, Chicago, Philadelphia, Indianapolis, Atlanta, San Francisco, Toronto, or any of our other offices located in principal cities.

7184-D

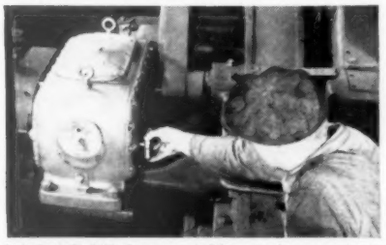
Feeder and Belt Conveyor

The Link-Belt Silverstreak Silent Chain Drive

Self-Aligning Belt Conveyor Idler

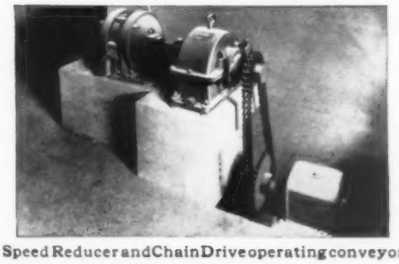


The Link-Belt Vibrating Screen



Link-Belt P.I.V. Gear variable speed transmission

Bearings, Collars, Hangers, Pulleys, Take-ups, etc.



Speed Reducer and Chain Drive operating conveyor

Steel Apron Conveyor handling rock

Inclined Conical Screens

PIT AND QUARRY, November, 1937. Vol. 30, No. 5. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price $1 for 1 year in the U. S. and possessions, Canada and Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter November 28, 1932, at the Post-Office at Chicago, Ill., under the Act of March 3, 1897. Additional entry at Milwaukee, Wis.

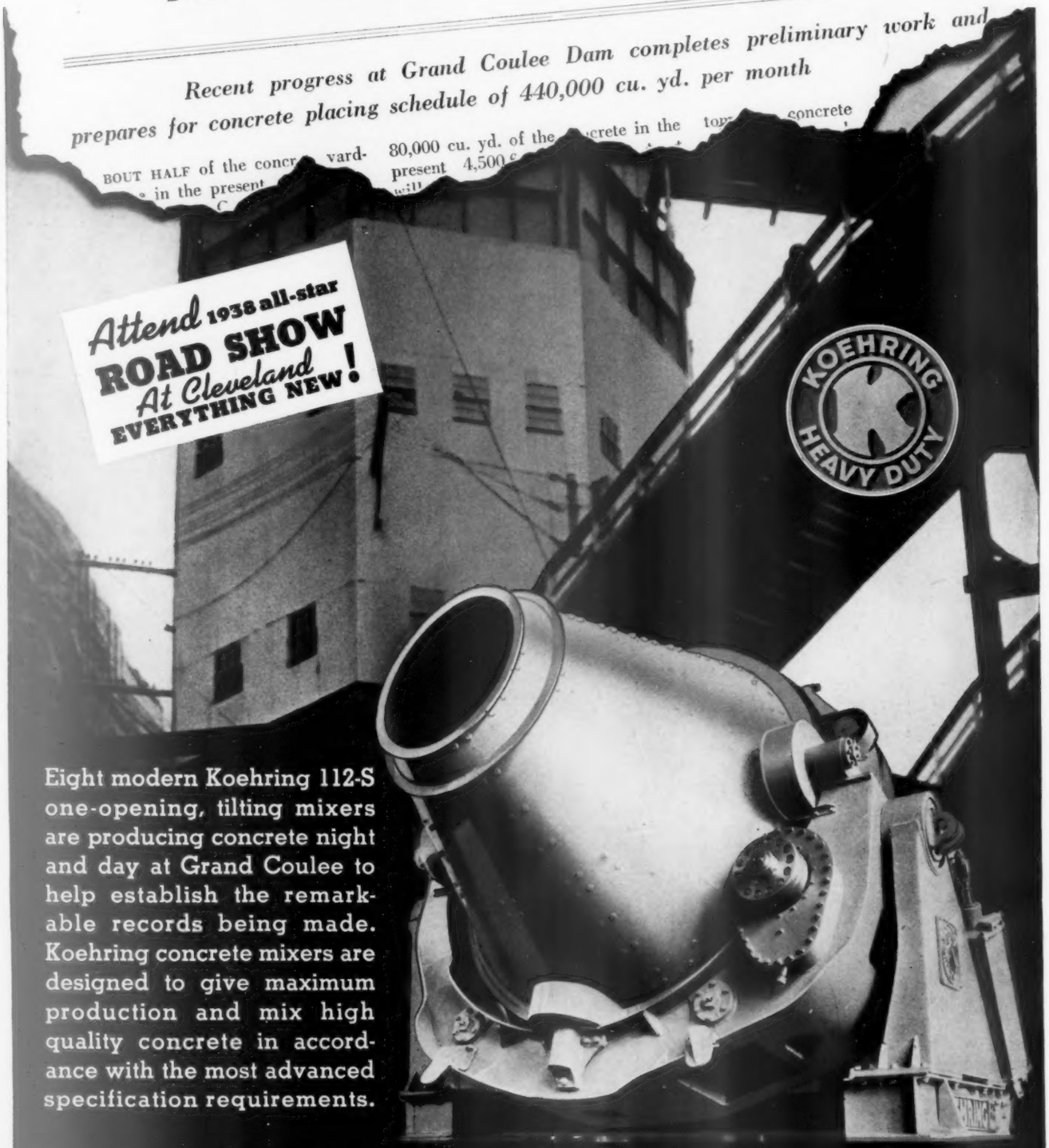
N BINDING

KOEHRING

New Record in Pouring Concrete

Recent progress at Grand Coulee Dam completes preliminary work and prepares for concrete placing schedule of 440,000 cu. yd. per month

BOUT HALF of the concr[illegible] yard- [illegible] in the present [illegible] C[illegible] 80,000 cu. yd. of the [illegible]crete in the top[illegible] concrete present 4,500 c[illegible] will[illegible]



Eight modern Koehring 112-S one-opening, tilting mixers are producing concrete night and day at Grand Coulee to help establish the remarkable records being made. Koehring concrete mixers are designed to give maximum production and mix high quality concrete in accordance with the most advanced specification requirements.

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

STOP!

Arrest the thief of your Production Time..

DUST

★ Sly Dust Collection supports the duty of modern industry to recognize its responsibility, not only to investment, but to workmen as well.

It costs less to get rid of the dust nuisance than to tolerate it. To control dust through Sly Dust Collector Systems is to increase the efficiency of workmen and avoid liability for the injury it may impose.

Install Sly Dust Collectors with the cloth filter in rock crushing plants, grinding plants, conveyors, elevators, etc.

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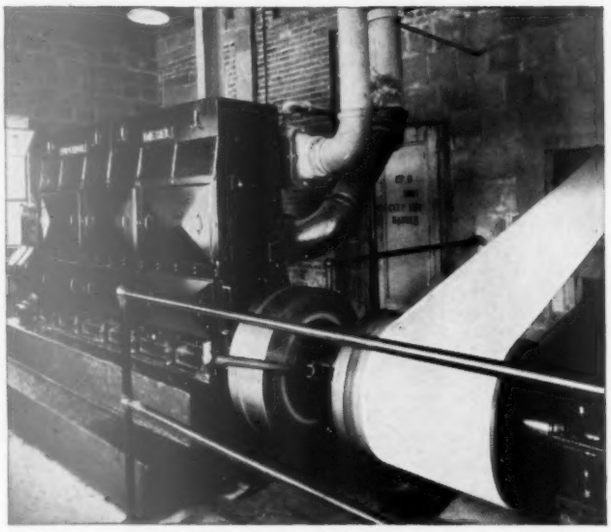
SLY is low cost Dust Collection

THE W·W SLY MFG·CO·CLEVELAND·OHIO

Economical, dependable power for brick and tile manufacturing plants

260 horsepower Superior Diesel assures economical power supply for Montrose Clay Products Company, Montrose, N. Y.



A huskier youngster replaced a veteran of 10 years when the new 6-cylinder Superior Diesel replaced the old 120 horsepower Otto-Superior Diesel in this plant.

The new engine like the old, is the only source of power. It drives the lineshaft system and a triplex pump supplying all the water for the plant. Twenty-four-hour service is the rule most of the year.

Variable speed of the engine regulates production. The engine cannot be overloaded because the auger press die will be forced off before the overload point is reached.

As it may be profitable to replace or supplement other prime movers in many plants with Superior Diesels, so may it be profitable to replace an old or overloaded Diesel with a larger, more modern Superior Diesel.

Let us suggest the most practical application of engines in your plant—this or any other industry.

THE NATIONAL SUPPLY COMPANY

SUPERIOR ENGINE DIVISION

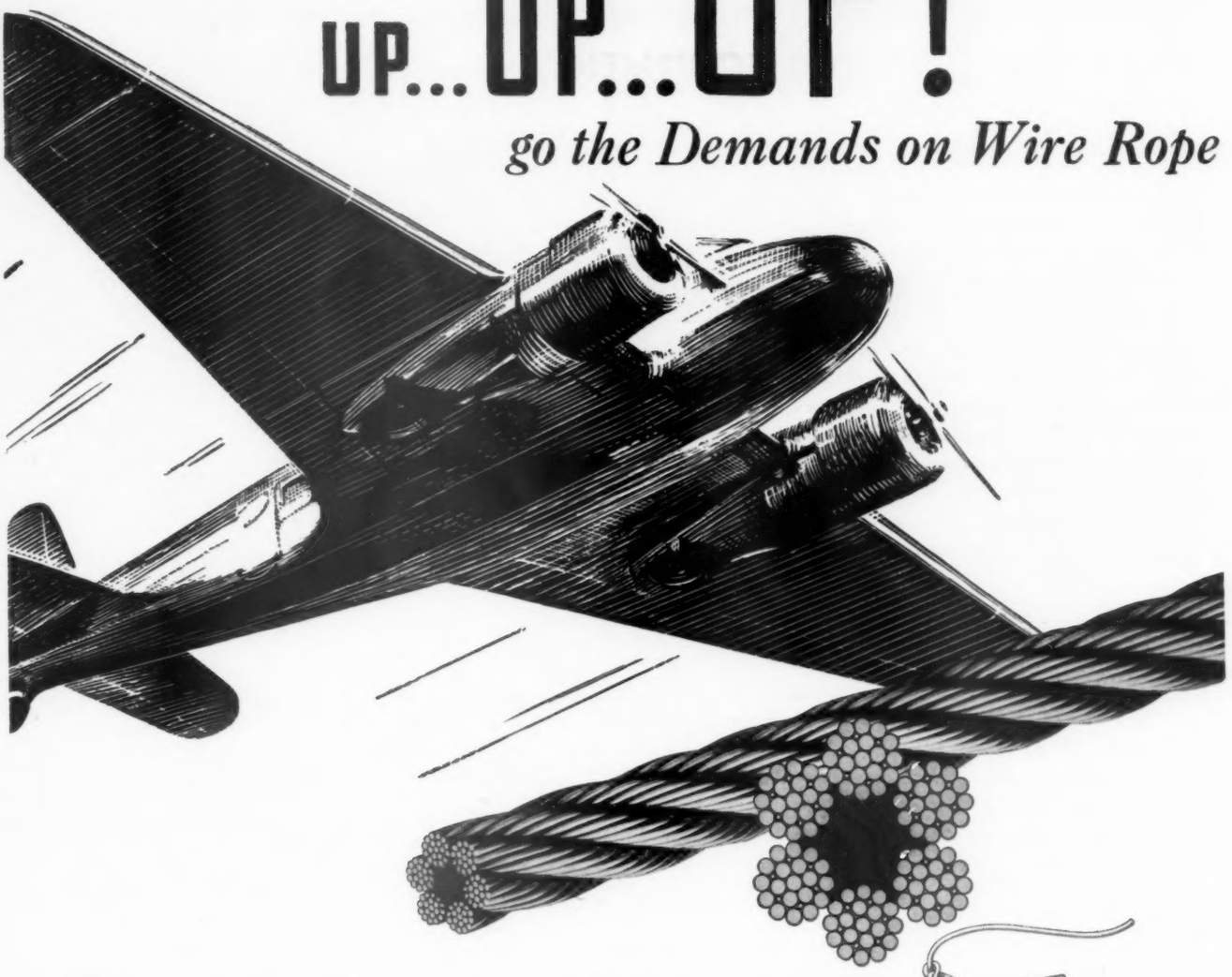
LOS ANGELES, CALIFORNIA SPRINGFIELD, OHIO PHILADELPHIA, PA.

Superior DIESELS

HEAVY DUTY MODELS: 50 to 810 H.P., 250 to 720 R.P.M. • HIGH SPEED MODELS: 15 to 150 H.P., 900 to 1800 R.P.M.

UP... UP... UP!

go the Demands on Wire Rope



Severest Requirements met by ROEBLING "BLUE CENTER"

To REDUCE operating costs to a minimum, it has been necessary in many instances to increase the capacity of wire rope rigged equipment. Speeds have been stepped up... loads boosted. As a result, wire rope has been called on to meet increasingly severe service.

For many applications where service conditions are severe, ROEBLING "Blue Center" WIRE ROPE has exactly met requirements. *It has proved conclusively that it assures lowest general average operating cost.*

If you are seeking a wire rope of superlative quality, one which will give you maximum safety and durability, at rock-bottom operating cost, investigate Roebling Blue Center... *the highest development in Roebling wire rope manufacture!*

JOHN A. ROEBLING'S SONS CO.
TRENTON, N. J. *Branches in Principal Cities*

The Highest Development in Roebling Wire Rope
1 STRONGER
Wire of highest strength consistent with ductility and toughness
2 TOUGHER
Provides maximum resistance against wear, sudden shocks, vibration
3 SAFER
Unequalled for uniformity of quality
4 SAVING
Insures lowest general average operating cost

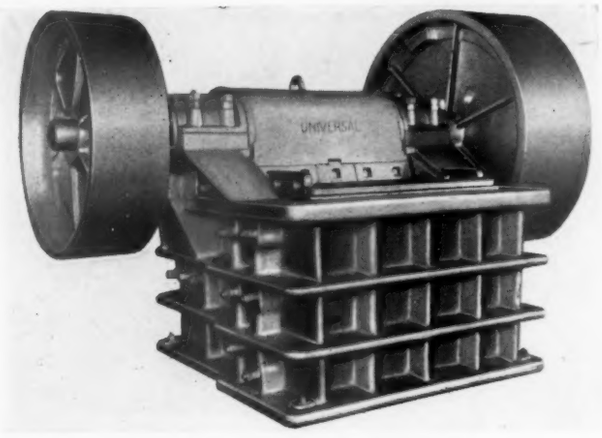
ROEBLING ✸ BLUE CENTER

CONSIDER THESE 3 POINTS IN CHOOSING YOUR CRUSHER!

IN BUYING CRUSHING EQUIPMENT, there are three important points to consider:

1 THE PRODUCT—Universal builds a complete line of crushers — Jaw Crushers for primary crushing, in 21 sizes with bronze bearings and 9 sizes with roller bearings; 5 types in two sizes of Roll Crushers for secondary crushing; special crushers for special applications; and Portable, Semi-Portable and Stationary Plants of all types for all purposes.

Every crusher in the line is ruggedly built to resist the most severe service abuse — wearing parts are of tough, abrasion-resistant manganese steel — bearings are oversize and located where they will render the greatest protection — all parts are carefully machined, insuring easy replacement of wearing parts—product size control mechanisms are easily and quickly adjusted. Everything is provided for simple installation, fast operation, long service and lowest cost per ton crushed.



One of 21 sizes of Universal Jaw Crushers

2 THE MANUFACTURER—Since 1906, Universal has been the leading manufacturer devoted exclusively to the building of crushing equipment. Universal's engineers developed many of the features now standard in crushing equipment, and many exclusive features found only on Universals. Skilled workers, most of whom have been building crushers for many years, operate Universal's well-tooled modern plant. The reputation and responsibility of this organization safeguard the customer's investment.

Plant of the Universal Crusher Company

3 THE SERVICE—Located in the geographical center of the country and with replacement parts stocked at fifteen strategically located warehouses, Universal is equipped to render the best possible service. Many models of crushers are carried in stock — others are quickly assembled from finished parts on hand. Competent Universal engineers are always available to lend advisory assistance.

Buying a Universal Crusher gives you this 3 point protection!

ORIGINAL FORCE FEED UNIVERSAL CRUSHER

CRUSHERS
STATIONARY AND PORTABLE PLANTS
PORTABLE WASHING PLANTS
PULVERIZERS
CONVEYORS
ELEVATORS, SCREENS, FEEDERS AND BINS

●

UNIVERSAL CRUSHER COMPANY
619 C Avenue West
Cedar Rapids, Iowa

Corner of the Replacement Parts Stock Room

UNIVERSAL

ONLY THOR ROCK DRILLS HAVE . . .

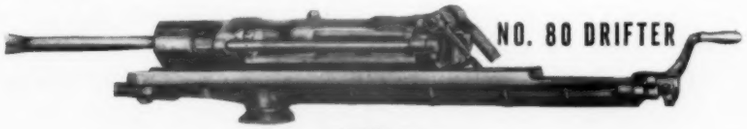
Measured Air

EVERY INCH OF POWER FROM EVERY FOOT OF AIR — Thor

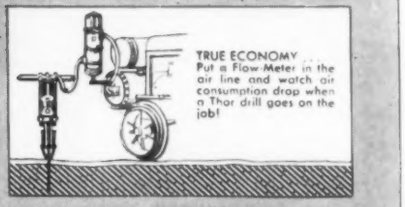
BASIC REASON FOR SUPER-DUTY AT AMAZING *Savings*

• *'Measured Air'*, the new principle in rock drill construction that gets "Every Inch of Power . . . From Every Foot of Air", is found only in Thor Rock Drills. Only Thor has perfected a valve that precisely controls the quantity of air admitted to the back of the piston hammer so that it functions perfectly on every stroke . . . assuring smooth, dependable operation.

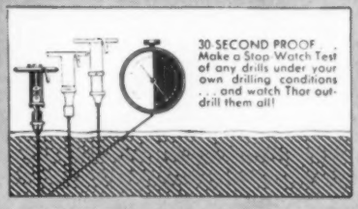
But smoother operation . . . with its resultant longer life . . . is only one of the advantages of Thor Rock Drills. For *'Measured Air'* brings superiority in ALL FOUR Basic Features that mean super-duty performance and amazing air economy. Get PROOF of performance before you buy another rock drill. Test all Four Features shown at the right on your own work. And for facts on how you can get faster drilling at lower cost, write today for your copy of an interesting booklet called, "What is 'Measured Air'?".



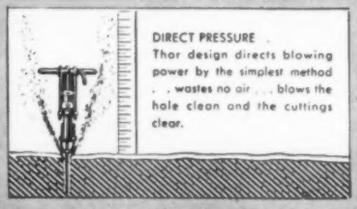
TOOL MAKERS — Thor — SINCE 1893



LOWER AIR CONSUMPTION



FASTER DRILLING SPEED


DIRECT PRESSURE . . .
Thor design directs blowing power by the simplest method . . . wastes no air . . . blows the hole clean and the cuttings clear.

GREATER BLOWING POWER

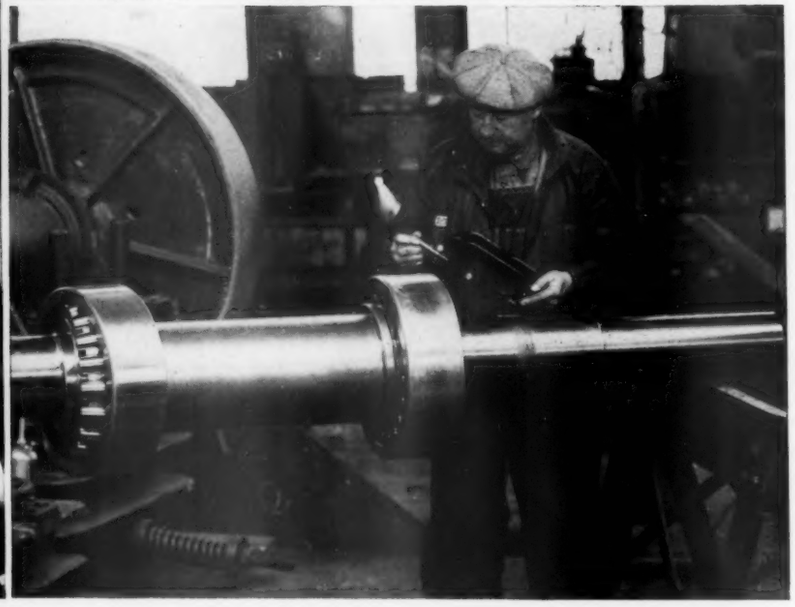
NO "STUCK" STEELS . . .
"Measured Air" brings EXTRA power for positive rotation. Thor drills keep going in the most difficult formations.

MORE POWERFUL ROTATION

INDEPENDENT PNEUMATIC TOOL CO.
600 WEST JACKSON BLVD., CHICAGO, ILLINOIS
COCHISE ROCK DRILL MFG. CO. Division 6200 E. SLAUSON AVE., LOS ANGELES, CAL.

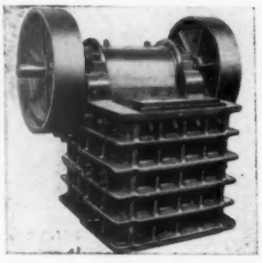
Birmingham, Ala. Detroit, Mich. Philadelphia, Pa. Toronto, Ont. Boston, Mass. London, England Pittsburgh, Pa.
Buffalo, N. Y. Milwaukee, Wis. St. Louis, Mo. Cleveland, Ohio New York, N. Y. San Francisco, Cal.

SKF-EQUIPPED BUILT BY PIONEER GRAVEL EQUIPMENT MFG. CO.



PIONEER PREFER SKF

for one of America's largest jaw crushers



● One of the largest anti-friction jaw crushers and one of the largest jaw crushers using the overhead eccentric.

● Here's a close-up of the pitman shaft on one of the largest jaw crushers in America. Note its rugged, self-aligning, self-contained roller bearings; they're the same bearings that are used on the world's leading crushers and pulverizers. For SKF's are practically standard on this type of machine.

Pioneer know that "the best bearings are the cheapest, and SKF Bearings are the best that money can buy. They are self-aligning—have great load-carrying capacity—require little power—save in lubrication—and the crusher can be started under load." Any machine that is SKF-equipped is built for the big, brute jobs of industry. 3965

MORE THAN
1200
TYPES AND SIZES

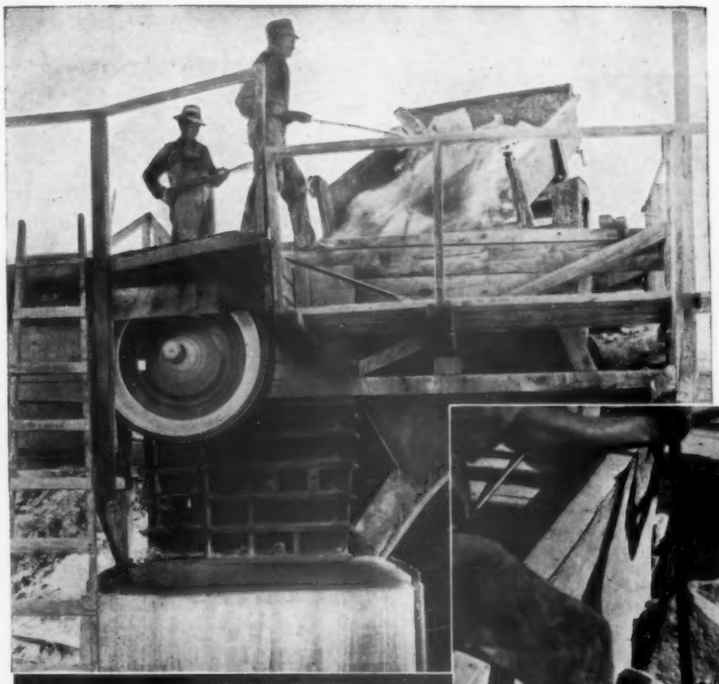
Industry comes to SKF for unbiased bearing counsel because SKF makes practically all types of anti-friction bearings.

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA., PA.

SKF

BALL AND ROLLER BEARINGS

MAKING LITTLE ONES OUT OF BIG ONES

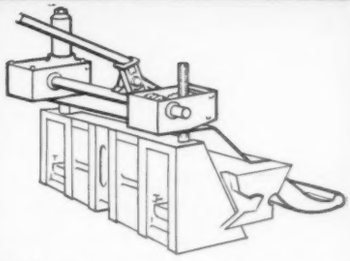


with a Pioneer

24-36

Jaw Crusher

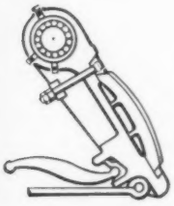
Paul Frank of North Vernon, Indiana, uses a Pioneer 24-36 Jaw Crusher for crushing the big ones. It saves dynamite and hand sledging.



The opening can be adjusted while the crusher is in operation.

•

Only 16 ton — Steel castings and overhead eccentric save excess weight.

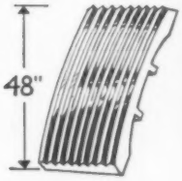


•

Overhead eccentric gives a force feed action and greater capacity.

•

Manganese steel Jaws 48" deep. Heavy corrugations—and reversible.



SKF

Bearings — Save power, lubrication, and replacements.

PIONEER

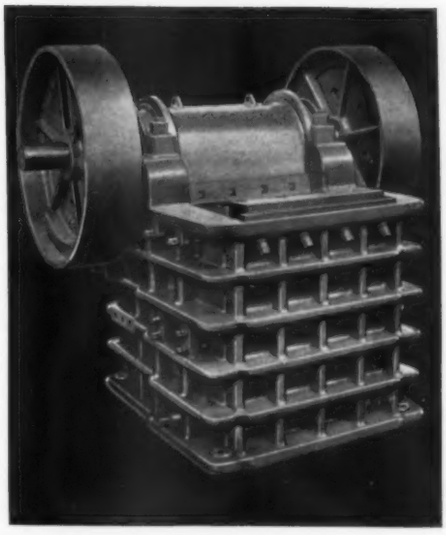
You, too, can solve your primary crushing problems

•

Investigate this 24"x36" Primary Jaw Crusher; it will save you money on your next job.

•

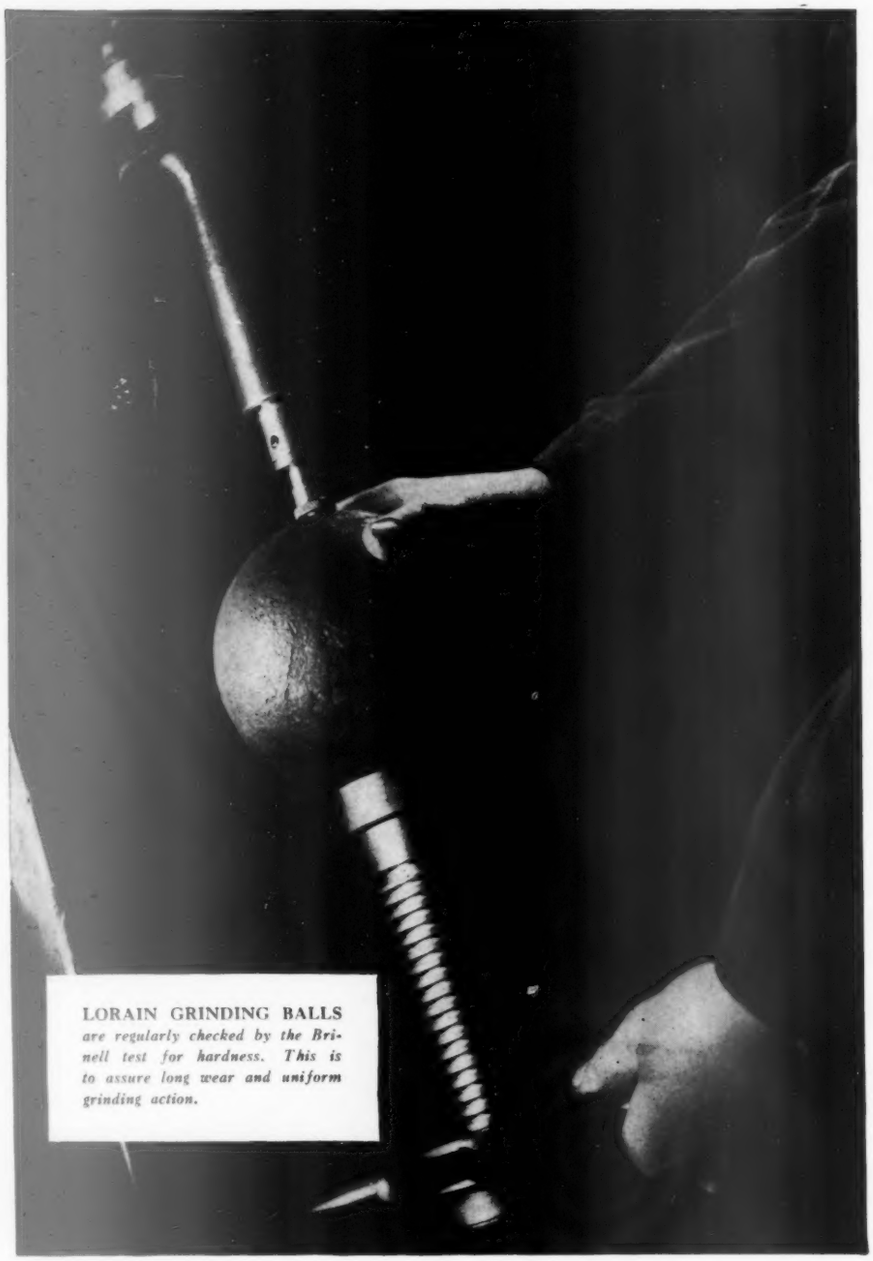
Our representative will call without obligation.



Pioneer Gravel Equipment Mfg. Co.

1515 CENTRAL • MINNEAPOLIS, MINN.

TRUE TO SPECIFICATIONS



LORAIN GRINDING BALLS *are regularly checked by the Brinell test for hardness. This is to assure long wear and uniform grinding action.*

OTHER LORAIN PRODUCTS Mill Liners and Screens of High Carbon Rolled Plate, Manganese, Chrome Nickel, Chrome Nickel Molybdenum, and plain Carbon Steel or Hard Iron; Hammers for Swing Hammer Mills, Industrial Cars, and Trackwork.

UNIFORMITY and economy in grinding requires balls that are *hard*—to withstand long wear in the mill . . . *resilient*—to take fast-repeating blows without splintering . . . *uniform* — to assist in maintaining the uniformity of your product.

USS Lorain Grinding Balls stand up under the heavy punishment of grinding mills because they are made exactly to specifications determined by the rough service to which they are subjected.

All USS Lorain Grinding Balls are forged to accurate size from new steel which has been rolled to definite specifications. Control of heat-treating processes, necessary for correct hardness, is effected by precise timing of movement through the cooling elements, temperatures being charted and frequently checked.

Because uniform wear is so important to efficient grinding action in your mills, we make doubly sure that USS Lorain Grinding Balls will be of uniformly high quality. From each production, samples are carefully checked in our laboratories. Measurements are made with extreme accuracy. Each production must be *as specified* . . . each production must be top quality . . . each must pass rigid tests within close tolerances — all of which guarantees greatest grinding action and long life.

USS Lorain Grinding Balls are available in the following sizes: ½", ⅝", ¾", ⅞", 1", 1¼", 1½", 2", 2½", 3", 3½", 4", 4½", and 5".

U·S·S LORAIN GRINDING BALLS

CARNEGIE-ILLINOIS STEEL CORPORATION

Lorain Division *Johnstown, Pa.*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

• *By loading out 700 to 800 tons of shot rock daily, this Lorain shovel equipped with new type boom keeps the crusher hustling at the quarry of the Valley Dolomite Company, Bonne Terre, Mo.*

DISHIN' UP ROCK for Hungry Crushers

It's the crusher that turns rock into ready cash. Profits depend upon your supplying it with all the material it can efficiently handle. That's why it's important that you select a shovel capable of maintaining a daily production which measures up to crusher capacity.

And here's the shovel that can dish it up. It's the 1½-yd. Lorain-77 with a boom that is made to order for quarry service. For the first time in history, quarries are offered a shovel boom which is designed accurately for torsion as well as bending and compressing stresses. Equipped with this rugged "front end," the Lorain-77 can be depended upon to deliver the goods day in and day out in the toughest rock digging.

Write today for complete information on the 1½-yd. Lorain-77 and this new boom development. Once you get the facts you will readily recognize this shovel's ability to take it as well as dish it up.

THE THEW SHOVEL COMPANY • LORAIN, OHIO

THEW CENTER DRIVE
REG. U.S. PAT. OFF.

1½ yd. LORAIN "77"

AS TOUGH AS AN ELEPHANT'S HIDE

REPUBLIC CONVEYOR BELTING

A conveyor belt that can endure the impact of large lumps of falling rock, withstand the gouging and abrasion of its sharp, cutting edges and handle its great weight has got to be plenty tough in both cover and body.

Republic manufactures conveyor and elevator belting that gives long service under such severe conditions. By the use of our cover and ply construction of high quality rubber compounds and heavy, special woven duck, these belts are made as tough as an elephant's hide. They can take hard, grueling punishment and like it.

There are many grades of Republic Conveyor Belts just as there are many classes of service conditions. It is best to choose for each job a grade that is on the safe side of quality. In quarry or sand and gravel pit operations, all conveyor equipment is put to abusive wear. Length of service is the most important factor in getting highest economy.

REPUBLIC RUBBER

Division OF LEE RUBBER AND TIRE CORPORATION

YOUNGSTOWN, OHIO

Manufacturers of HOSE
BELTING • PACKING
MOLDED PRODUCTS

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR

1 ENGINE SELLS 3 MORE

One of the two crusher-operating D8800 Engines—on belt drive. Consumes 15 to 18 gallons of low-cost Diesel fuel per 10-hour day.

A D8800 operating air-compressor. Consumes 30 to 34 gallons of fuel in ten hours of full-capacity going. (The D6600 driving generator consumes about 1½ gallons of fuel per hour.)

THE first "Caterpillar" Diesel Engine it bought proved so satisfactory that the Charlottesville (Va.) Stone Co. bought three more for their crushing and screening plant. Being one hundred per cent "Caterpillar"-equipped has brought power-costs 'way down.

These four Diesels (totaling 300 hp.) keep two crushers, one air-compressor and one generator-set going at an approximate fuel-and-lubrication cost of only 81c an hour—or about 3¼c per ton of output. Engine-maintenance and repair-expense to date have been slight.

No deep study or comparison is required to show that this is far less than the usual cost of other types of power. And economy is not the only feature of these carefully engineered power-units. . . . Steady, dependable performance has given the foreman (Mr. Mott) good ground for being enthusiastic in his praise of them.

What has been done in power-cost savings through changing over to "Caterpillar" Diesels can likewise be achieved by other pit and quarry owners operating with less modern types of power. For facts-and-figures on Diesel requirements for your particular plant, call in a "Caterpillar" dealer—or, write to us direct.

SEVEN ENGINE SIZES—44 TO 160 HP.

CATERPILLAR DIESEL ENGINES

REG. U.S. PAT. OFF.

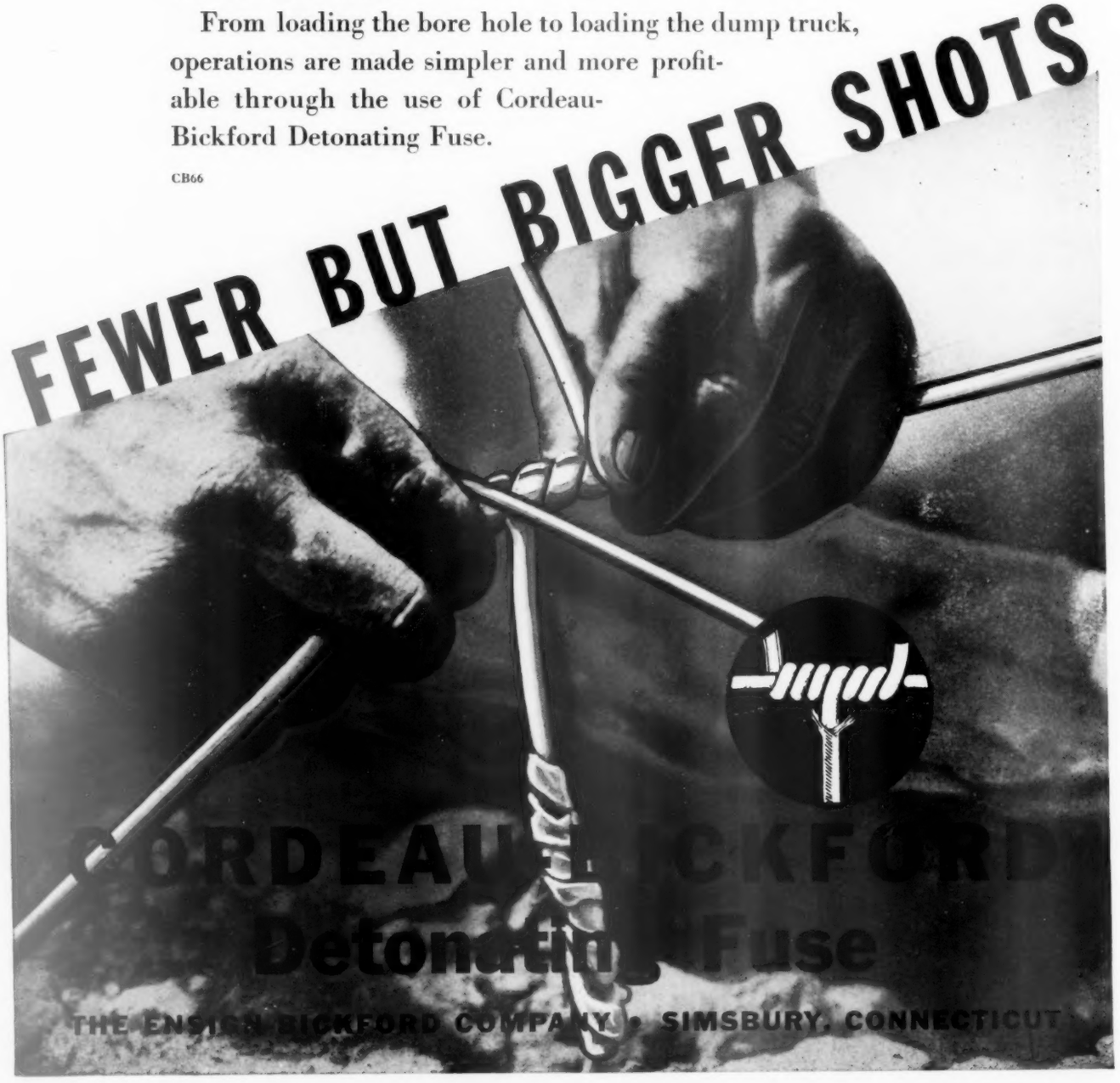
CATERPILLAR TRACTOR CO., PEORIA, ILL. . . . WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES

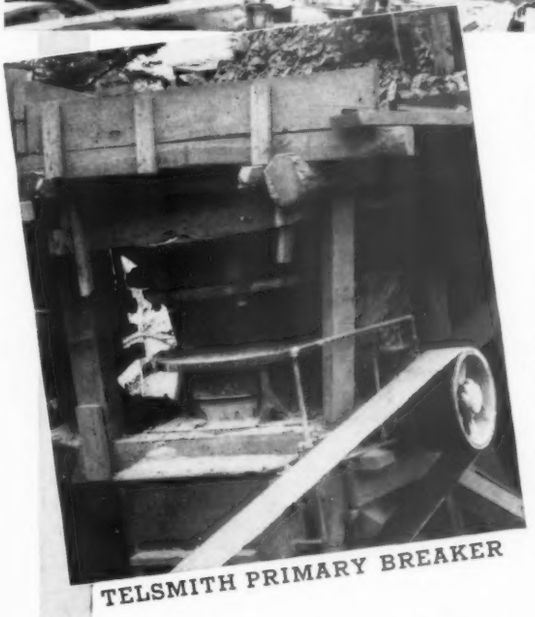
Equipment Moved Less Often

Detonation of charges with the use of Cordeau-Bickford Detonating Fuse is so complete and so dependable that there is almost no limit to the size of the blast, the depth of the holes, or the intricacy of the hook-up. There is an obvious saving in keeping the drills, compressors, lines, and other equipment on the job until all the holes are ready to be fired at one time. And there is a further saving in keeping the removal equipment continuously at work without having to move it back and forth between minor blasts.

From loading the bore hole to loading the dump truck, operations are made simpler and more profitable through the use of Cordeau-Bickford Detonating Fuse.

CB66





TELSMITH PRIMARY BREAKER

CRUSHED STONE *for Roads*

AT THE LOWEST COST PER TON

A well-known Southeastern contractor, E. W. Grannis of Fayetteville, N. C., had his troubles in crushing hard abrasive rock for road grading and surfacing jobs. Jaw crushers proved unsatisfactory for both coarse and secondary crushing —also very expensive to maintain. Rolls also proved inadequate. Along with other big operators, Grannis has solved his crushing problems by discarding jaw crushers for Telsmith gyratory breakers. For secondary crushing, roll crushers were replaced by Telsmith Gyraspheres — with distinctly better results.

Mr. Grannis had a 6½ mile road job at Mocksville, near Statesville, N. C. And it meant 50,000 tons of minus 1½ in.— crushing granite boulders and field stone. So he bought this complete Telsmith rock crushing plant—(A) No. 13B Telsmith Gyratory Crusher; (B) 32 ft. No. 6 Telsmith Belt Elevator; (C) 4 ft. x 10 ft. Telsmith double deck Pulsator Screen; (D) 16 in. x 22 ft. Telsmith Reject Conveyor; (E) No. 36 Telsmith Gyrasphere Crusher. The screen is mounted over a 25 cu. yd. bin. A 100 hp. Diesel powers the equipment.

This Telsmith plant has convincingly demonstrated its ability to produce stone for road grading and surfacing at the lowest possible cost per ton. And it has set a remarkable record for low maintenance. Whether you are planning a new plant or modernizing, *write for Bulletin E-15* describing Telsmith quarry and gravel pit equipment. G-3

TELSMITH GYRASPHERE

SMITH ENGINEERING WORKS

504 E. CAPITOL DRIVE — MILWAUKEE, WIS.

Associates in Canada: Canadian Ingersoll-Rand Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver

50 Church Street, New York City
81 Binney St., Cambridge, Mass.
201 N. Wells, Chicago, Ill.
412 Westinghouse Bldg., Pittsburgh, Pa.
1013 Commercial Trust Bldg., Philadelphia, Pa.
Brandeis M. & S. Co., Louisville, Ky.

TELSMITH

Is Your Business Civilized?

HAVE you ever stopped to consider why social historians call this era civilized? Have you ever thought what there is about your conduct that makes you a civilized being? These questions appear pertinent because not every one recognizes the characteristics of civilization or of civilized behavior.

The test of civilization is "belonging", that sense of being a part of some group — the family, clan, neighborhood, church, club, scientific or professional body, city, state, nation, mankind. Civilization is that state of mind which acknowledges each man's insufficiency as an individual, his dependence on other individuals — on their physical, spiritual and mental support — for the necessaries, comforts and security of life. It admits the perils of detachment and safeguards itself against them by alinement with groups having like interests exposed to like risks. It is willing to concede something of its individual pride for the greater asset of group confidence, to merge its individual identity in the more impressive identity of the group, to waive some of the egoistic claims of the rabid individualist in deference to the superior claims of the group, to contribute to the well-being, to share the dangers, and to partake of the responsibilities of group life.

THE conditions, the ideas, the standards that have made you civilized — and without asking you whether you liked it or not — make your business civilized, too. If it were not civilized, it would perish, just as the lone ant, the lone wolf, or the lone man would perish without group support. Your business pays its share through taxation for the assurance provided by government for the protection of property rights, the guarantee of liberty of action, the right to transact business. Through insurance it pays its share of the cost of recouping its possible future losses from fires, floods, storms, riots, bad credits, and individual deaths. Through advertising and personal selling it pays its share of the cost of winning the public good-will that insures the future profits of your enterprise. Through its purchase of materials, machinery and supplies, through its employment of labor, through its watchfulness of its competitors, through its concessions to its customers' demands, in all these ways your business demonstrates its complete lack of self-sufficiency, its utter inability to stand alone, its real dependence on the social organism in which it lives. Remove any one of these and it will die!

Your business is a part of all these things, belongs to all these things, is therefore civilized. But has it stopped there? Has it failed to grasp the opportunities, the responsibiliies, the protection of industrial identity and industrial strength attainable through trade-association membership? Have you overlooked the fact that your business is part of an industry—just as you are a part of your community—that you utilize its accumulated store of knowledge, that you draw on its experience and discoveries, that you avail your-self of its professional and other skilled members to further the profit-making ends of your business? You take all these things from your industry as if by right; what, one may well ask, does it receive from you in return?

UNLESS you belong to and support, with ideas, counsel, encouragement, convention attendance and money, the national association of your industry, you are lagging in the civilizing of your business. You are benefiting from your industry's cumulative efforts to better its condition, to improve its outlook, to insure its future, to break down the barrier of buyer-resistance (perhaps to the very product you make); why not lift some of the debt you have incurred—even though it lies on you through no fault of your own—and become an active and a virile part of your industry's national association?

Don't let your business be one of those "don't wanna play" boys. Don't let it remain an idle spectator, a side-line critic. You're not the kind of man to slide through a revolving door on the other fellow's push.

Dig in with both feet—your brains and your means. Make your industry's fight your fight, in spirit as well as in fact. Carry part of the load, if for no other reason than that you have been profiting and will continue to profit from the results of its work. Be a good sportsman! Be a good business man!

This advertisement has been prepared and the space for it donated by Pit and Quarry Publications voluntarily in the interest of promoting trade-association membership and it appears without the knowledge of any association officer or member.

Ludlow-Saylor Wire Cloth

is made in special metals and alloys to resist any chemical or physical conditions.

For resistance to acids or caustics, to heat, vibration or abrasion—whatever the special requirements, the RIGHT Wire Cloth will get maximum effective performance from any process or equipment.

"Getting Results with Ludlow-Saylor Screens" is a 200-page summary of America's latest achievements in screening practice and screen-control of process operations . . . A copy will be sent free upon request to any reader of Pit and Quarry

LUDLOW-SAYLOR WIRE CO.
610 S. Newstead Ave.
St. Louis, Mo.

Please send us Book No. 48-E "Getting Results."

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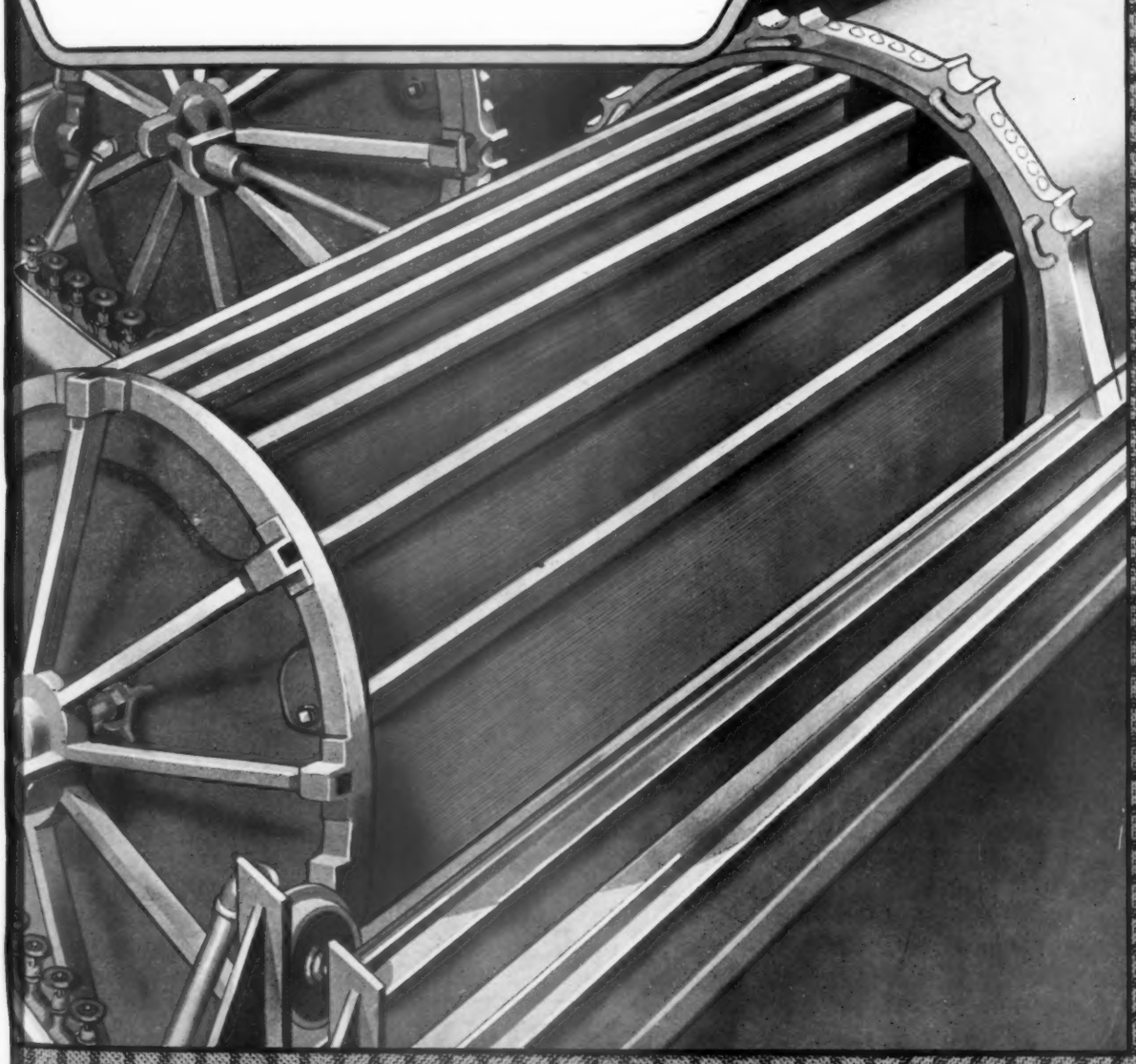

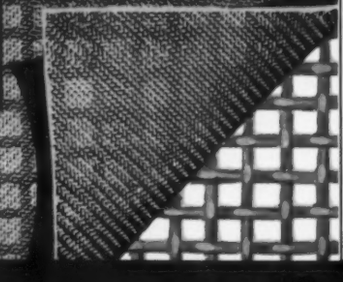

LUDLOW-SAYLOR WIRE COMPANY ST. LOUIS
610 S. NEWSTEAD AVE.

"Getting Results with Ludlow-Saylor Screens"

Properly chosen Ludlow-Saylor Screens have aided many industries toward maximum productiveness of Plant and Equipment Investment.

"Getting Results with Ludlow-Saylor Screens"

is a 200-page summary of America's latest achievements in screening practice and screen-control of process operations.

A copy will be sent free upon request to any reader of Pit and Quarry

LUDLOW-SAYLOR WIRE CO.
610 S. Newstead Ave.
St. Louis, Mo.

Please send us Book No. 48-E "Getting Results."

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The LUDLOW-SAYLOR WIRE COMPANY
SAINT LOUIS
610 S. NEWSTEAD AVE.

Control DUST FOG FUME MIST

Cover The Full Range—From Coarse to Fines—From Fines to Fume . . . .

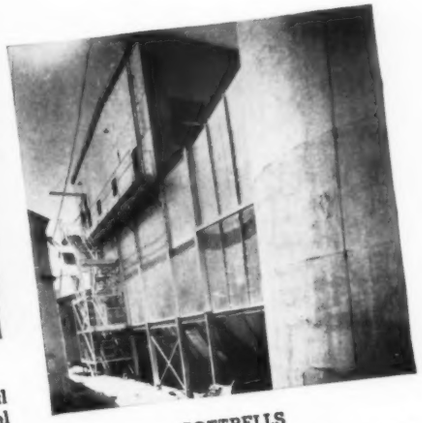
Equipment installed by Western Precipitation Corporation provides for the control of every phase of the dust and fume problem. Given a specific condition, or a combination of conditions, equipment that is exactly correct and free from approximations can be designed and installed, resulting in maximum efficiency and economy.

IMPAX SEPARATOR

This is a simple device for separating coarse particles from fine dust. Where either the coarse or fines are valuable separately, an Impax Separator automatically delivers the coarse in one hopper and passes the fines for collection in Multiclones or Precipitators. No moving parts. Impax Separators are successfully used where there are crushing, grinding or screening operations. Having a frictional resistance of only a fraction of an inch of water, Impax Separators can be applied to existing hog fuel installations for the removal of cinders, thereby minimizing abrasion and maintenance expense on induced draft fans.

MULTICLONES

Multiclones are assemblies of individual small tube collectors arranged in parallel to provide any desired capacity. They will show extremely high efficiency in collecting particles down to the lower micron brackets. Preceded by by an Impax Separator, gases containing both coarse and fine particles can be thoroughly cleaned, and the separation is automatic. Multiclones render excellent service because of their simplicity, flexibility in capacity, low draft losses, freedom from fire hazards and their initial economy. The illustration shows an Impax Separator in combination with a Multiclone.



COTTRELLS

Cottrell Electrical Precipitators are internationally admitted to be the most efficient and most versatile type of equipment for the collection of dust, fog, fume and mist. They operate at temperatures as high as 1400° F., handling acid or alkaline gases, and can be built to show efficiencies to 99.99%, according to the separation requirements. Capacities range from a few c.f.m. to 2,500,000 c.f.m. or over. Cottrells are used in nonferrous industries, iron blast furnaces, electric furnaces, powdered fuel plants, cement mills, paper mills, sulphuric acid plants, and can be adapted for any problem of dust, fog, fume or mist control.

Exclusive specialization on dust and fume problems for more than thirty-one years, with constant research and progressive engineering development, is a guaranty of the prompt and intelligent application of equipment that will most adequately and economically meet any condition arising from the necessity of abating a nuisance or recovering values, or both. Send for Bulletins.

WESTERN PRECIPITATION CORPORATION

1018 West Ninth Street, Los Angeles, California • • New York, N. Y.

PRECIPITATION COMPANY OF CANADA, LTD., Montreal

P I O N E E R I N D U S T A N D F U M E C O N T R O L

Announcement

Twenty-First Annual Convention National Crushed Stone Association

Netherland Plaza Hotel Cincinnati, Ohio

JANUARY 24, 25 and 26, 1938

In conjunction with which will be held

THE MANUFACTURERS' DIVISION EXPOSITION OF MACHINERY, EQUIPMENT, AND SUPPLIES

THE Annual Convention of the National Crushed Stone Association, during the years since its inception, has become recognized as an event of outstanding significance to crushed stone producers individually and to the industry as a whole.

It serves, as no other medium can, to develop, crystallize, and express industry opinion. It signifies solidarity of purpose and the ability of those engaged in the same line of activity to unite in the solution of common problems.

As individuals, producers will find much to reward them for a visit to Cincinnati next January: Speakers of outstanding reputation and experience will discuss problems of timely interest, both technical and legislative; opportunity will be afforded for the mutually beneficial exchange of opinions with fellow-producers, to say nothing of the pleasure to be derived from renewing old acquaintanceships; the Manufacturers' Division Exposition will command studious attention for the helpful suggestions to be obtained from an inspection of the latest developments and improvements in machinery and equipment used in the crushed stone industry.

All crushed stone producers of the United States and Canada, whether or not members of the National Crushed Stone Association, are cordially invited to attend our Twenty-first Annual Convention. Make your plans now to be present at Cincinnati on January 24, 25 and 26, 1938.

1918 National Crushed Stone Association 1938

1735 Fourteenth Street N. W. Washington, D. C.

EVERY 3 WEEKS A NEW MARION TYPE 4161

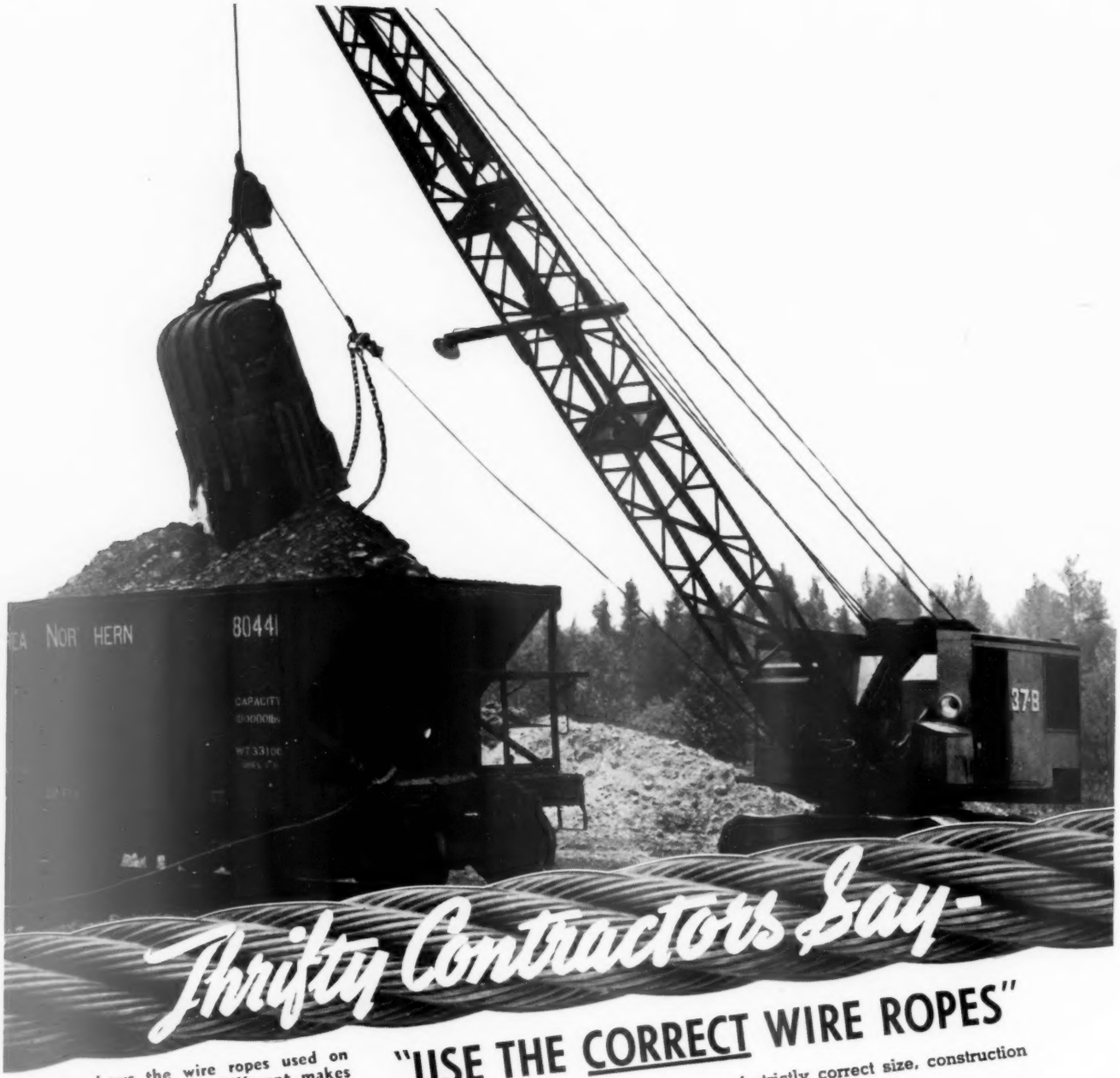
EXCAVATOR GOES INTO ACTION . . .

establishing new yardage and maintenance records in the metallic and non-metallic industries. There is a definite reason for this. Let us prove it to you with actual performance figures - not just claims.

MARION'S LARGER EXCAVATORS
4101
4121
4161

The MARION

STEAM SHOVEL COMPANY • MARION, OHIO



Thrifty Contractors Say—

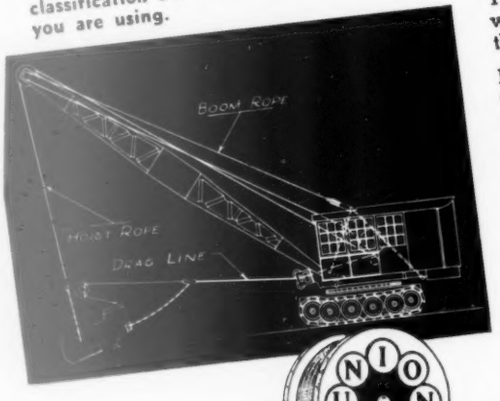
"USE THE CORRECT WIRE ROPES"

"Equip each machine with the ropes of strictly correct size, construction and grade."

This is the recommendation of contractors who really get their money's worth from wire ropes. These contractors know, from actual experience, that correct wire ropes give much longer service than "incorrect" ropes.

From the complete line of UNION Wire Ropes, including both ordinary type and preformed (UNIONformed),—you can be sure of getting the rope exactly suited for each purpose. And if you want assistance in selecting the proper ropes for your equipment, write our engineering department. Our engineers will gladly specify the ropes that will give you the lowest-cost service.

Diagram shows the wire ropes used on one type of Drag Line. Different makes of Drag Lines have different rope requirements. When writing for recommendations of our engineers, give full classification data covering each machine you are using.



UNION WIRE ROPE CORPORATION

General Office and Factory: 21st and Manchester, Kansas City, Mo.
Chicago District Office and Warehouse: 431 West Pershing Road.
Telephone Yards 1659
Portland, Ore.: 2415 N. W. 22nd Ave.
In Mexico: E. O. Chapa, Calle Damas Sur 13, Tampico—Madero 2, Mexico D. F.
Export Agents: Lucey Export Corp. (Exclusive)
3505 Woolworth Bldg., N. Y. Broad St. House, London, E. C. 2, England
Distributors in Leading Cities throughout the Country

UNION WIRE ROPES

The "ULTIMATE LOW COST WIRE ROPE"

IMPREGNABLE!

In the Allis-Chalmers Seal-Clad Motor the wound stator receives impregnating treatment, similar to the conventional type of winding. Then a Moulded Shield of high dielectric and mechanical strength is fitted into a machined slot in the stator frame and tightly sealed into position with a special compound—thus giving complete protection to the coils.

This feature makes Allis-Chalmers Seal-Clad Motors impregnable to metallic dust, grit, oil, moisture, chemicals and other agents destructive to motor windings.

One or more of these destructive agents are present in every plant, to a greater or lesser degree . . . so why take a chance?

If your plant conditions are severe, the ultimate in motor protection is essential to you—Allis-Chalmers Seal-Clad Motors offer the ultimate in motor protection. If your plant conditions are not so severe as to make this protection absolutely essential, Allis-Chalmers Seal-Clad Motors are still the soundest investment you can make, BECAUSE YOU ARE GIVEN THIS GREAT ADDITIONAL PROTECTION AT NO ADDITIONAL COST.

For further details, write today for Leaflet No. 2182.

The Allis-Chalmers Mfg. Co. builds standard motors of every type from 1 hp. up—also motors for special application.

784

MOTOR DIVISION

ALLIS·CHALMERS

MILWAUKEE WISCONSIN

ABOUT THIS QUESTION OF FEDERAL LEGISLATION

What Can the Sand and Gravel and Ready Mixed Concrete Industries Expect as to

The Black-Connery Wage and Hour Bill

Will this bill pass at the special or regular session? How seriously will it affect wages and hours and labor conditions in the industries? Will its operation influence labor costs in 1938?

The Labor Disputes Act

What effect has this law had on labor relationships in the industries? Does the law really cover the industries? Will it be amended at the next session?

Federal Tax Laws

Has the surtax on undistributed corporate profits retarded the industrial building market? Does the law operate unfairly on small companies and those with debt retirement obligations? Will it undergo drastic revision at the next Congress?

Federal-aid For Highways

Will Congress renew the regular Federal-aid highway program for the calendar years 1939 and 1940? Does the Administration look with favor on this type of Federal expenditure? What part has the Federal Government played in the development of the highway program?

Federal Antitrust Laws

What is the policy of the Administration toward antitrust law enforcement? Will there be a drastic revision of these laws at the next session? What is the attitude of Congress toward the basing point and delivered price systems.

W.P.A.

To what extent has the W.P.A. program increased the number of governmental plants? Will the demand for budgetary retrenchment produce a curtailed W.P.A. program in 1938? What effect has this program had on industrial employment?

These and other questions will be discussed at the

Twenty-second Annual Convention and Exposition

NATIONAL SAND AND GRAVEL ASSOCIATION

Eighth Annual Convention and Exposition

NATIONAL READY MIXED CONCRETE ASSOCIATION

NETHERLAND PLAZA HOTEL
CINCINNATI, OHIO

January 31, February 1, 2 and 3, 1938

A NEW NOTE IN CRAWLER CRANE DESIGN

SWING, HOIST, TRAVEL, BOOM UP OR DOWN AT THE SAME TIME

follow the trend

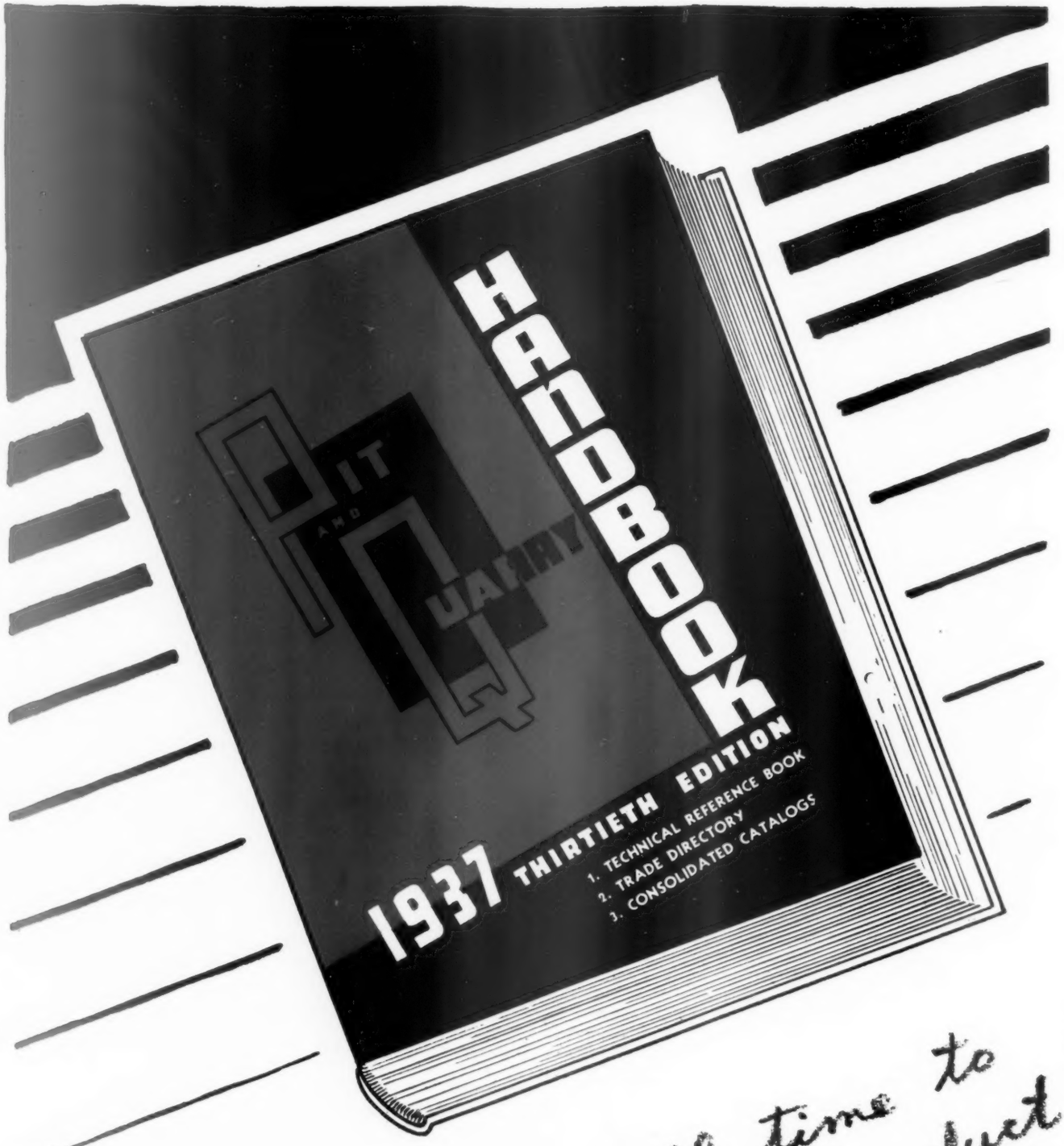
A new note in crawler crane design has been sounded by LIMA. It is now possible to have a machine with which all major operations can be accomplished simultaneously. Hoist, swing, travel and boom up or down at the same time, is a feature of great importance to contractors who handle a wide variety of work. If your job is confined to space limitations it is certain that it can be handled quicker and better with a LIMA. LIMAS independent clutch control plus scores of other exclusive features are your assurance of more profitable and efficient crane operation.

Write for a copy of bulletin No. 3.

LIMA LOCOMOTIVE WORKS, Incorporated
SHOVEL and CRANE DIVISION LIMA, OHIO, U. S. A.

New York, N. Y. 167th St. and Sedgwick Ave.	Newark, N. J. 317 Frelinghuysen Avenue	Seattle, Wash. 1932 First Ave., South
Dallas, Texas 1304 McKinney Ave.	Memphis, Tenn. 77 McCall St.	Los Angeles, Calif. 2001 Santa Fe Ave.
San Francisco, Calif. 200 Bush Street	Tyee Machinery Co., Ltd. Vancouver, B. C.	The General Supply Co. of Canada, Ltd. Ottawa, Ont.

LIMA



There's still time to Catalog your product! .... write for Rates and Reservations

Here's Your Market for 1938

Pit and Quarry HANDBOOK offers you 100% sales coverage for all of the coming year—a year that business leaders say will continue the sensational come-back for the heavy industries.

Housing programs, road building, land development projects and government construction on a huge scale, all point to an unprecedented demand for basic materials.

As the one and only Directory of all *producing plants* and *purchasing personnel* in the cement, gypsum, lime, sand, gravel and crushed stone fields, the HANDBOOK is the key to your advertising campaign.

List your entire line in this Buying Manual of the Pit and Quarry Industry—and your sales message will go to every prospect who authorizes or approves purchases in the 5,100 producing plants in the industry.

This is your logical market and your 1938 advertising will not be complete unless you include a page or series of pages in the HANDBOOK to catalog your products.

Act now, before the closing date of publication makes you miss your market.

PIT AND QUARRY PUBLICATIONS
538 SOUTH CLARK ST., CHICAGO

★

THAT CLEARANCE PREVENTS JAMMED BITS

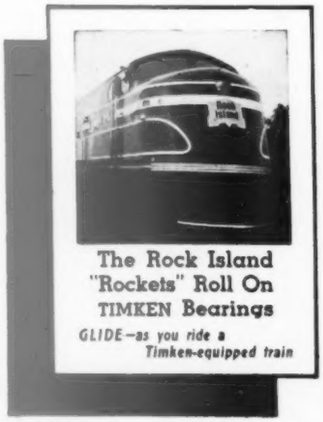
The shoulder construction of the TIMKEN Rock Bit prevents the steel from bottoming in the bit. The force of the drill blows is transmitted through the shoulder on the steel. Thus the end of the steel cannot upset or mushroom and so cause the bit to become jammed.

Several years ago, before the Timken Bit was put on the market—we experimented with many different types and designs of bits—including designs with no shoulder on the steel, the end of which was in constant contact with the bottom of the bit.

The trouble we had then in our experimental tests with jammed bits, damaged threads and broken steel proved the impracticability of this type of construction and we discarded it as a possibility for a successful commercial product. These experiments *did* result, however, in the creation of the Timken shoulder construction which has solved every problem.

Timken Authorized Conversion Shops make the conversion of existing steels—round or hexagon, any size—for use with TIMKEN Bits easy and convenient. There is one at the other end of your telephone.

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; Timken Rock Bits; and Timken Fuel Injection Equipment.



The Rock Island "Rockets" Roll On TIMKEN Bearings

GLIDE—as you ride a Timken-equipped train

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN ROCK BITS

Proved ON THE RANGE

for greater digging power

MINE operators that are using Northwest shovels have been amazed by the tremendous digging power demonstrated. Northwest machines have replaced other shovels and reduced the amount of blasting required.

Northwest shovels have unusual and exclusive advantages that make them real Rock Shovels.

The Northwest Independent Crowd utilizes forces that other shovels waste, giving extra digging power. Backed by the Northwest Welded Boom and dipper sticks and a heavy duty, slow speed engine that meets the "drag-down" loads without stalling, it offers the hard rock man a combination of features that can push a dipper through rock without a stutter and bring it up heaping every time. That means money!

You can cut ore handling costs with Northwest "extra" digging power.

Above: Northwest shovel loading ore for Canisteo Cliffs Mining Co.

In circle: Northwest Model 80 shovel. Here is the huskiest front end on any shovel, size for size.

NORTHWEST ENGINEERING COMPANY

1822 Steger Building 28 East Jackson Boulevard Chicago, Illinois

NORTHWEST

BRUTES!

Make Tough Jobs Easy —Make Pay Loads Pay!

IT TAKES a *he*-tire to do a dump truck's work. Even then—the toughest, sturdiest kind of tire must be suited to the job it's got to face if it's going to perform efficiently and economically.

That's why Goodyear offers you a choice of three great dump truck tires. They're big, tough, husky brutes—each one built to do a particular type of dump truck work better and longer than any other tire made—to make the toughest job easier—to dig in, pull through and hold up under the worst possible service without holding up your trucks or men. They save you time and money.

There's the All-Weather Dump Truck Tire (1) for all-around dump truck work; the Pneumatic Lug Tire (2) for trucks that plow through gouging, cutting, tread-ripping rocks and sharp stones; and the Goodyear Sure-Grip (3) that digs in without slipping in the worst kind of sloppy, soft or sandy going.

The difference in these tires is in the tread—each fitted to a different type of going. Underneath is the sturdiest, longest-lasting construction it is possible to build into a tire: Patented, pre-shrunk Supertwist Cord—blowout protection *in every ply;* specially-processed, chemically-toughened rubber in both tread and body; braided wire beads.

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PIT AND QUARRY

Vol. 30 November, 1937 No. 5

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Published on the tenth of each month for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other nonmetallic minerals. Copyrighted 1937 by Complete Service Publishing Co., 538 South Clark Street, Chicago, Ill.

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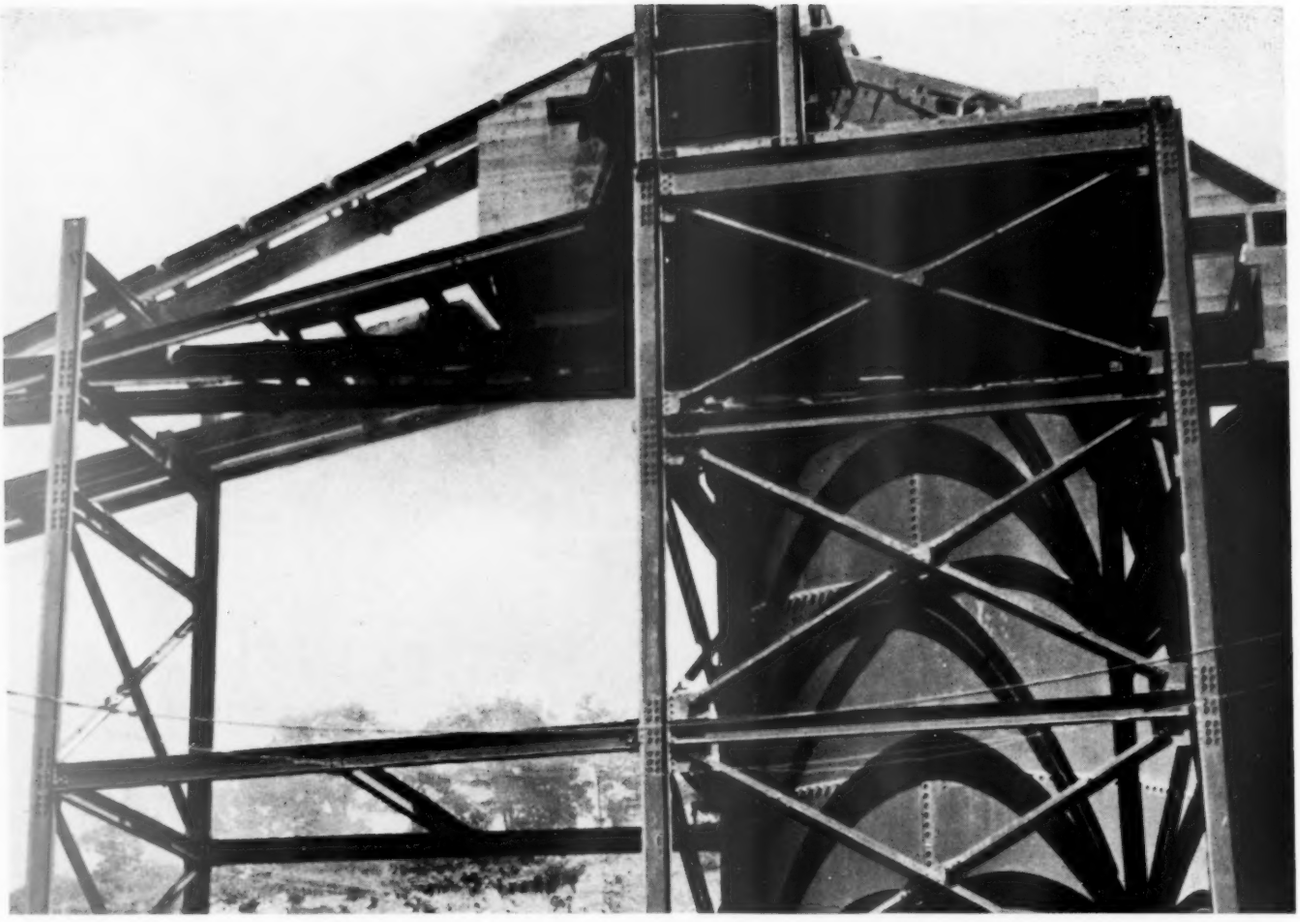

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PIT AND QUARRY

CHICAGO NOVEMBER, 1937

Florida's $3 Cement Levy Is Sustained

CEMENT PRODUCER WINS SUIT

The Florida Supreme Court on Oct. 12 unanimously upheld a bill passed by the 1937 state legislature levying an inspection fee of $3 per ton on cement brought into the state. The state highway department had refused to enforce the law and the Florida Portland Cement Co. sought and obtained from the Supreme Court an order compelling enforcement of it.

The bill was attacked by the highway department primarily on the grounds of certain irregularities in its passage and also on the ground that the fee amounted to a tariff on interstate commerce and was prohibited by the constitution.

In its decision the court held that the irregularities in passage were not sufficient to void the bill and held further that the levy was for inspection purposes only. Although the federal gorvernment reserves all power over tariffs, the court held, it permits the states to lay imposts "which may be absolutely necessary for executing its inspection laws". The court held that the fee would have been unconstitutional if it had been levied to raise revenue for the state.

Universal-Atlas Fetes Ahnfelt and Carlson

Two veterans in the cement industry, with total service records of more than 75 years, were honored recently when thirty-five business associates of J. A. Ahnfelt and A. G. Carlson, retiring operating manager and chief engineer, respectively, of the Universal Atlas Cement Co. tendered them a farewell luncheon at the Union League Club, Chicago. Mr. Ahnfelt had been with the company for 42 years and Mr. Carlson 34 years.

P. C. Van Zandt, vice-president, presided and talks were made by B. F. Affleck, former president of the company, O. N. Lindahl, comptroller, and E. D. Barry, manager of industrial relations. Numerous telegrams from plants and offices of the cement company were read felicitating Messrs. Ahnfelt and Carlson on their records and extending good wishes for the future.

Northwest Magnesite Co. Announces Pension Plan

The Northwest Magnesite Co., Chewelah, Wash., has put into effect a pension plan and established group insurance for its employees.

E. A. Garber, vice-president and general manager, announced the provisions of the pension system on his return recently from the east. Any employee who has been with the company 25 years may retire at the age of 70 on one-third pay. If he has worked for the company 30 years he may retire on one-third pay at 65.

It is said that this company has an unusually large number of long-time employees.

Foundry-Sand Plant Is Under Construction

A new plant which will produce washed silica sands for the foundry trade is under construction at Newport, N. J., by Whitehead Bros. Co., New York, N. Y.

Operation is scheduled for early next year.

Fire Causes Damage at Pipe Plant in Indiana

Fire caused damage of $25,000 when it practically destroyed the plant of the Gray Concrete Pipe Co. at Bridgeport, Ind., recently.

A garage housing several motor trucks was saved by firemen.

Agstone Institute to Convene Nov. 12-13

WILL GATHER AT FRENCH LICK

The annual convention of the Midwest Agricultural Limestone Institute will be held at French Lick, Ind., on Friday and Saturday, November 12 and 13.

In addition to the membership, which comprises all agricultural-limestone producers in the middle-west, there will be in attendance representatives from University of Illinois and Purdue University, the Illinois Geological Survey and the Illinois Agricultural Assn.

There will be special sessions at the convention for traffic men of the various producing companies, and for book-keepers, auditors and comptrollers.

Among the more important topics of discussion will be coöperative advertising, uniform terms and discounts, sales tax and traffic matters.

Directors and officers for 1938 will be chosen.

This will be the first two-day convention of the institute, as in the past it has met in single-day sessions.

Predicts U. S. Will Aid Phosphate Development

Prediction that $5,000,000 in federal funds will be made available for development of southern Idaho phosphate beds was made recently by Governor Barzilla W. Clark of Idaho.

Funds would be used for construction of a power plant on the Snake River, near Bliss, to produce electricity for a plant to convert phosphate rock into fertilizer.

The Idaho department of public works and the planning board are now making phosphate surveys in southeastern Idaho.

Bleaching-Earth Mill Opened in Tennessee

IS NEW INDUSTRY FOR STATE

Bleaching earth, extensively used in the refining of petroleum and vegetable oils, is the latest addition to the minerals industry of Tennessee. Production of bleaching earth was recently begun by the Tennessee Bleaching Clay Corp. from its new, modern processing mill at Paris in Henry County, a west Tennessee county long famous for its mining of high-grade pottery clays. This new industry, based largely on preliminary investigations by the Tennessee Division of Geology, will use clays of the Porters Creek (Tertiary) formation, a natural resource that has, heretofore, been practically ignored by the clay-mining interests of the region. Production from the new mill will be confined, for the present, to natural bleaching earths particularly suited to petroleum refineries.

The officials of the new organization are J. K. Dick, president; Sam Kohn, vice-president; and C. E. Hastings, secretary-treasurer, all of Paris, Tenn. An experienced operating engineer has been employed as superintendent.

The Porters Creek clay being exploited by the Tennessee Bleaching Clay Corp. has not been previously developed in Tennessee. Studies of the West Tennessee occurrences of Porters Creek clay in 1934 by George I. Whitlatch, assistant geologist of the Tennessee Division of Geology, showed that numerous deposits in this formation had definite oil-bleaching possibilities. Subsequent investigations of these Tennessee clays by the U. S. Geological Survey confirmed these findings and called attention to the fact that some of the deposits were even superior in quality to similar bleaching clays mined in Illinois. The Tennessee Bleaching Clay Corp. was organized largely because of the favorable findings of these preliminary studies. Later studies published by Dr. Whitlatch show that Porters Creek clays may also be adapted to the bleaching of cottonseed oil and other vegetable oils. Four cottonseed-oil refineries operating at Memphis constitute a lucrative potential market for the products of the new mill at Paris, and refineries for peanut, soya-bean, corn and other vegetable oils at Louisville, Ky., Cincinnati, O., Atlanta and Savannah, Ga., Oklahoma City, Okla., Dallas, Ft. Worth, and Houston, Tex., and several other southern cities are also potential markets for the new industry.

The new mill of the Tennessee Bleaching Clay Corp., designed and equipped by the Williams Patent Crusher & Pulverizer Co., of St. Louis, Mo., is of modern design in which drying, grinding, and classifying are done in a single continuous operation. The grinding is done by a hammer-mill, and during this process, hot air at temperatures ranging between 800 and 900 deg. F., introduced into the mill under forced draft, partially dries the clay. The ascending currents of hot air carry the particles of ground clay up a long flue to an air-separator, drying of the clay being completed during its passage up the flue. The classification of the ground clay is done by centrifugal force in the air-separator, which is equipped with a cyclone dust-collector for the finest particles of clay. Further grading of the clay, before it goes to storage, can be done in a revolving screen.

The product supplied to petroleum refineries has a particle-size distribution of: 1 per cent. on 100-mesh, 30 per cent. on 200-mesh, and 69 per cent. through 200-mesh. Earths for vegetable-oil bleaching will be ground to 200-mesh and finer, approximately 43 per cent. of the clay particles being less than 300-mesh size.

All the mill equipment is powered with a 100-hp. International Diesel engine using fuel oil. Heat supplied to the hammer-mill for drying is generated by an oil-burning kiln.

The output of the present equipment is between 1½ and 2½ tons of finished earth per hr.

Stone and concrete are being employed in the erection of a new office building at the plant of the Farmington Gravel Co., near Farmington, Ia.

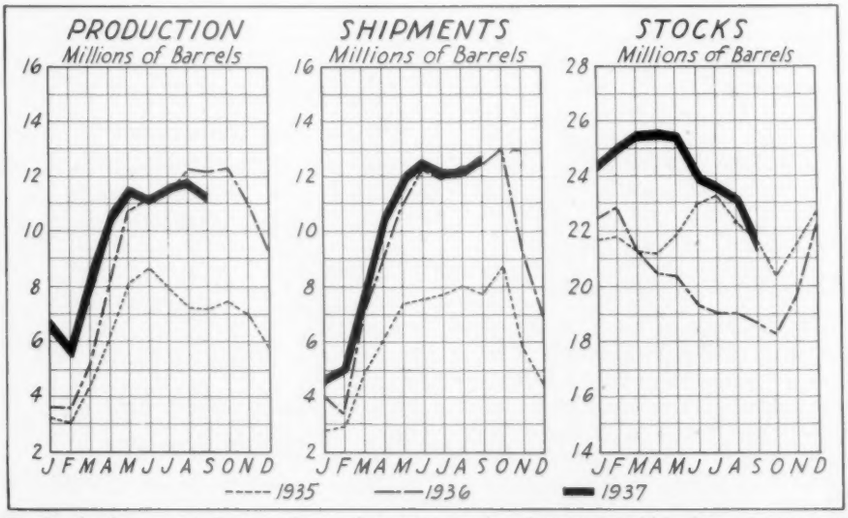
Reflecting the growth of the ready-mixed-concrete business, the Colonial Concrete Co., West Orange, N. J., recently added three truck-mixers, one of which is pictured above. The mixers are 3-cu. yd. Jaegers; the trucks are Autocars.

Praises German Cement and Highway Industries

The United States can learn a lot from Germany in the way of highway construction, and the cement industry can learn a lot from Germany and the Scandinavian countries, according to William Wallace Mein, president of Calaveras Cement Co., San Francisco, who recently returned from a five-months' inspection of the cement industry in Europe. He said that due chiefly to rearmament programs and small home construction the cement industry abroad is experiencing a boom.

"In Germany's concrete road building program," said Mein, "the best American practices have been adopted. Divided traffic lanes and grade separations are features of these roads."

Sweden, Germany and France are making outstanding scientific progress in the manufacture of cement, he said, and, despite cheap labor and power, cement prices in Europe are so high that many antiquated plants are operating at a profit.



The Portland-cement industry in September, 1937, produced 11,223,000 bbl., shipped 12,773,000 bbl. from the mills, and had in stock at the end of the month 21,389,000 bbl., accoording to the Bureau of Mines. Production of Portland cement in September, 1937, showed a decrease of 9.1 per cent. and shipments an increase of 1.2 per cent. compared with September, 1936. Portland-cement stocks at mills were 14.1 per cent. higher than a year ago.

Norman G. Hough, well-known figure in the lime industry, is in charge of the new lime-putty plant pictured above, installed recently under Brooks-Taylor patents by the Richter Concrete Corp., Cincinnati, O. Mr. Hough was formerly president of the National Lime Assn. and more recently general sales manager of the Kelley Island Lime & Transport Co.

Cement Specifications Have Been Published

A.S.T.M. "Standard Specifications for Portland Cement"—C9-30 were revised September 1, and now appear in their latest revised form, C9-37, in the *1937 Supplement to Book of A.S.T.M. Standards*, p. 49.

The only revision in this specification is the deletion of the No. 200 sieve-fineness requirement. This requirement was dropped because it was felt that Portland cements are now so finely ground that sieve residues are meaningless, except for certain control operations in the manufacturing process. The committee is studying those properties of cements that are affected by fineness in order to develop best methods and requirements that will have more significance than the 200-mesh sieve test. In deleting the No. 200 sieve-fineness requirement, no provision was made for a fineness requirement based on the turbidimeter. Hence, A.S.T.M Specification C9-37 contains no requirement for fineness whatsoever. It should be noted in this connection that the American Assn. of State Highway Officials revised its Specification M-5, Standard Specifications for Portland Cement, in 1937. In this revision the 200 sieve-fineness requirement was dropped and a surface area requirement of 1600 sq. cm. per gram by the Wagner turbidimeter was added.

"Standard Methods of Sampling and Testing Portland Cement"—C77-32 were also revised September 1, by the addition of chemical determinations which formerly appeared in Sections 1 to 10 of the "Tentative Method of Chemical Analysis of Portland Cement"—C114-35T. The Standard Methods C77-37 now appear in their latest revised form in the 1937 *Supplement to Book of A. S. T. M. Standards*, p. 54.

Producer in New York Acquires Gravel Plant

The Metropolitan Sand & Gravel Co. of New York, N. Y., has sold its plant and deposit at Northport Harbor, N. Y., to the Goodwin-Gallagher Sand & Gravel Co., leading producer and distributor in the metropolitan area.

The price, according to revenue stamps affixed to the deed, was in the neighborhood of $450,000.

Erects Cement-Packing Plant at Chatham, N. B.

★ Canada Cement Co., Ltd., is completing the erection of a storage-and-packing plant at Chatham, N. B., according to F. B. Kilbourn, vice-president.

The plant is similar to those now operated by the company at Quebec and Halifax and will be served by the company's steamship *Bulkarier* for the distribution of cement in New Brunswick and Prince Edward Island.

★ The Vulcan Iron Works of Wilkes-Barre, Pa., is fabricating a rotary kiln and other equipment for the Universal Atlas Cement Co., involving the expenditure of approximately $175,000, according to press reports.

. . SCREENINGS . . . . .

The Standard Lime & Stone Co. has applied for TVA power for use at its quarry and plant near Knoxville, Tenn., seeking to tap the line which will serve the Volunteer Portland Cement Co. * * * * *The Ash Grove Lime & Portland Cement Co. is reported to be considering the installation of a mineral-wool plant near its quarry and plant at Chanute, Kan.* * * * Ready-mixed concrete is now being furnished the construction industry in the Grand Rapids, Mich., area by the Grand Rapids Gravel Co. * * * * *Closing of the Kyrock plant for an indefinite period has been announced by H. S. Carmichael, vice-president, Kentucky Rock Asphalt Co.* * * * After forcing the company to cease operations a year or so ago, the Santa Cruz, Cal., zoning board has rescinded its action and will allow Hart Bros. to operate its sand-and-gravel dredging plant in the San Lorenzo River. * * * * *Rebuilding of the Alsen, N. Y., plant of the Lehigh Portland Cement Co. will start early next year, according to rumors.*

One of the largest graphite desposits on record was discovered almost in the shadow of the "Lucky" Baldwin gold mine in the San Gabriel Valley in California recently. * * * * *The reorganization plan of the Lincoln Sand & Gravel Co. of Lincoln, Ill., has been approved by Federal Judge Charles G. Briggle, sitting at Springfield, Ill.* * * * A portable plant has been operating in recent months near Rockford, Ia., owned by the Winona Sand & Gravel Co., Winona, Minn. * * * * *The name of the Republic Portland Cement Co., San Antonio, Tex., has been changed to Longhorn Portland Cement Co., to better identify it with its trade-name.* * * * New hoppers and a conveying system costing $7,500 are being added at the Wauwatosa, Wis., plant of the Jaeger Sand & Gravel Co., of Milwaukee. * * * * *Mississippi may soon have a cement plant operating within its borders following the incorporation of the Cotton States Portland Cement Co. of Jackson.* * * * * Charging that dust emanating from the plant near Sonora, Cal., has ruined his crops, a rancher has sued the United States Lime Products Corp. for $20,000.

Three new kilns are reported to be in prospect for the lime plant of Vermont Associated Lime Industries, Inc., near Leicester Junction, Vt. * * * * *Net income of the United States Gypsum Co. for the first half of the year was $3,401,253 compared with $2,241,774 for the same period of 1936.* * * * Mineral-wool as well as cement-asbestos shingles will be produced at a new plant at Long Beach, Cal. for which contracts were recently signed by the Johns-Manville Co. * * * * *London, England will shortly have its first ready-mixed-concrete operation, six plants served by Jaeger truck-mixers being located at strategic points by the newly-formed Express Supply Concrete Co., Ltd.* * * * More than $50,000 will be expended by the Dixie Culvert & Pipe Co. of Memphis on a concrete-pipe plant near Baton Rouge, La.

Along the railroad tracks entering the town of Beltsville, O., are these 80-year-old ruins of two lime kilns, used when the Ohio lime industry was in its infancy. Living a stone's throw away is John Puffenberger, age 76, who drove a team and wagon as a young man bringing cord-wood to fire the kilns.

Asphalt-Paving Meeting at Memphis on Dec. 6

Advance indications are that more than 700 highway officials, engineers and asphalt technicians will participate in the seven sessions of the eleventh National Paving Conference, starting in Memphis on December 6. The meeting will be sponsored by the Asphalt Institute and the Assn. of Asphalt Paving Technologists.

Major themes of the conference will be highway economics, subgrade stabilization, asphalt highways and asphalt for airport surfaces, river and harbor protection, country highway sidewalks, soil-erosion control and moisture conservation. Three technical sessions, additional, will include the reports and papers presented by the Assn. of Asphalt Paving Technologists.

Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads will attend in order to outline the Federal Government's highway program with special emphasis on the latest results of soil-stabilization experiments.

Urges All Compensation Laws Cover Silicosis

The problem of silicosis continues to receive attention from industrial groups, insurance carriers, and federal agencies. At a recent Department of Labor conference, it was agreed that compensation laws of all states should make provision for silicosis coverage. It was recommended further that Federal legislation should give more adequate financial support to government agencies for the study of the medical, engineering, economic, legal, and insurance phases of the silicosis problem.

From Toronto come reports that traces of aluminum dust in silica-laden air tend to inhibit silicosis (*P. & Q.*, Oct., 1937, p. 45). Other researchers in the past have concluded that certain other dusts including calcium carbonate also may have some protective action and may assist the lungs in dust elimination.

Still the best known methods for preventing and controlling silicosis are segregation of dust-producing operations, dust control, ventilation, protective devices, good housekeeping and medical supervision including periodical X-ray chest examinations. Materials in dust-laden atmosphere that inhibit silicosis may have practical application in a few instances but it would seem better general practice to eliminate the dust itself from air breathed by workmen. Pure air is much pleasanter and safer to breathe than dust, regardless of the nature of the dust.

Winter Shutdown to be of Short Duration

Because of one of the best years in its history, the plant of the Monolith Portland Midwest Co., Laramie, Wyo., will shut down only two or three weeks this winter probably in December, to recondition its machinery for the new season, according to F. J. Anderson, plant superintendent. During the depression years the plant was often closed for as long as three months during the winter. In 1937 the plant's business is running only slightly behind that of last year, the best in its history.

Vulcanite Will Resume Operations Next Spring

According to George P. Todd, secretary-treasurer of the Vulcanite Portland Cement Co., the company will resume operations at its plant at Vulcanite, N. J., early next spring after making some changes in the plant. During the present year the concern has redeemed $85,000 in outstanding bonds.

Buys Dolomite Quarry; Installs Equipment

★ New equipment is being installed at the dolomite plant and quarry at Riverside, Cal., recently acquired by the San Gorgonio Rock Products Co. of Banning, Cal.

Production at the new operation will be about 250 tons daily. The plant has twice that capacity, however.

Construction Awards Begin Tapering Off

NINE-MONTH TOTAL IS HIGH

Construction work started during September in the 37 eastern states fell almost 10 per cent. below the level for September, 1936 and was off by almost 28 per cent. from the August, 1937 total, according to F. W. Dodge Corp. The September figure for all classes of construction amounted to $207,071,800 which compares with $234,271,500 for September, 1936 and $285,104,100 for August of this year.

Of the current September total $65,589,800 went into residential building; in September last year this class recorded a volume of $80,670,800 while in August of this year residential building amounted to $73,448,300. Excepting only the upstate New York, Middle Atlantic, the Southeastern, and the New Orleans territories declines from a year ago in residential building were general.

Non-residential building operations in September amounted to $75,660,000 which compares with $69,098,700 for September, 1936 and $117,209,800 for August, 1937. Public works and utilities construction started in the 37 eastern states in September amounted to $65,822,000 as contrasted with $84,502,000 for September of last year and $94,446,000 for August of this year.

For the first nine months of 1937 the total volume of construction work undertaken in the 37 eastern states amounted to $2,307,014,300; this was an increase of 13 per cent. over the total of $2,041,628,200 shown for the corresponding nine months of 1936.

The residential building total for the initial nine months of the current year amounted to $736,390,600 for a gain of 25 per cent. over the total of $588,031,600 reported for the corresponding nine months of last year. Non-residential building volume recorded thus far in 1937 amounted to $894,894,900 against $735,337,100 for the like 1936 period. Public works and utilities construction thus far in 1937 totaled $675,728,800 as compared with $718,259,500 for the nine-month period of 1936.

The Portland Cement Assn. safety trophy, awarded for operating throughout 1936 without a disabling injury, was dedicated Sept. 25 at the Hudson, N. Y., plant of the Universal Atlas Cement Co. The Waco, Tex., plant of the company, with a similar record, dedicated its trophy on Oct. 9.

Michigan's Silicosis Law Now in Effect

31 DISEASES ARE COMPENSABLE

Michigan's new occupational-disease law, providing that 31 diseases be compensable the same as lost-time accidents occurring as a result of a man's employment, became effective Oct. 29.

In preparation for enforcement of the act, employers, employee organizations and insurance carriers met with the state department of labor and industry at Detroit Oct. 21-23 to discuss problems arising as a result of the statute.

Workmen in the state will be protected in cases of sickness covered by the law at rates comparable to those in industrial accidents. The maximum benefit for dust diseases contracted in employment is about $3,000, as compared with $9,000 for other scheduled diseases.

Silicosis and lead poisoning have been giving industry and insurance carriers particular concern because of their prevalence in so many industries and because of the comparatively long time it takes for them to develop to a disabling degree.

Industrial firms are asking their employees to submit to physical examinations to determine whether or not they already have an occupational disease. Industry is coöperating to a greater degree than ever before with various agencies interested in preventing the causes through safety engineering methods, according to Charles E. Gauss, state insurance commissioner.

Report Japan to Erect Cement Plant on Island

The U. S. Department of Commerce reports that a Japanese news agency has been carrying stories of plans of the Japanese South Sea Industrial Co. to erect a cement mill on one of the mandated Japanese islands, using the lime available on Palao Island. The company plans to produce about 30,000 metric tons annually, according to the report.

Inland Lime & Stone Co. Has Football Team

The Inland Lime & Stone Co., Manistique, Mich., has a football team this fall, composed of former Manistique high school grid stars. Harvey Quick is coaching the aggregation and Paul Vizena is manager of the team.

Some of the players on the squad include Messrs. Peasley, Reid, Davenport and Multhaupt, ends; Carpenter, Bond, Eggertsen, Carlson and Berger, tackles; Mott, Norton and Mueller, guards; Dewey and Jahn, centers; Rogers, Marks, Rubick, Dugas and Basonic, backs.

Concrete-Pipe Producer Locates at E. St. Louis

The Nelsen Concrete Culvert Co., with a plant at Urbana, Ill., has purchased the former Zelnicker Supply Co. plant and 12 acres of land at East St. Louis, Ill., where it will manufacture all sizes of concrete pipe to supply southern Illinois.

C. S. Ward and T. J. Walsh, both of Paris, Ill., are in charge of preparing the plant, and will assume management of both production and sales. About 50 men will be employed at the plant.

Proximity of raw material, including sand, crushed stone and cement, and good transportation facilities were considerations in locating the plant at East St. Louis.

Along the Labor Front

The Peerless Cement Employees' Assn., independent union, won the right to represent the employees of the Peerless Cement Corp., Detroit, Mich., at an election conducted by the National Labor Relations Board on Oct. 7. The workmen voted 73 to 51, the minority representing votes cast for the United Mine, Mill and Smelter Workers, a C. I. O. affiliate.

* * *

According to John Mitchell, representative of the Indiana Division of Labor, workers at the Mitchell, Ind., plant of the Lehigh Portland Cement Co. on Oct. 9 voted to join the National Council of United Cement Workers, affiliated with the American Federation of Labor. The vote was 132 to 7.

* * *

The National Labor Relations Board on Oct. 11 concluded its hearing of the dispute between the Cowell Portland Cement Co., Cowell, Cal., and the C. I. O. The hearing lasted 19 days, having opened Sept. 23. Findings have been forwarded to Washington, D. C. and a decision is expected shortly. Operations at the Cowell plant have been practically at a standstill since trouble developed in July.

A view of the Brewer pug-mill and clay-feeder in the calcium-chloride road-stabilization plant being operated by the Ohio Gravel Co. at Newton, O. Walter Flach, general superintendent and chief engineer, designed the plant and directs its operation.

W. Va. Farm Bureau to Establish Lime Plant

Plans for the establishment of a $200,000 lime plant to supply the needs of its members have been launched by the West Virginia Farm Bureau, it is reported. Authority to go ahead with the project was granted by the Bureau at its annual meeting last August.

The location of the proposed project has not been revealed but one of the prominent financial institutions of Baltimore, Md., is said to have pledged its support in financing the plant up to 60 per cent., the remainder to be raised by the sale of stock among members of the Bureau.

Preliminary inquiries indicate that members will be able to take the entire output with little difficulty. The bureau estimates that it will be able to supply the commodity through its coöperative at about half the prevailing market price. Transportation will be done entirely by Diesel-powered trucks, it is said.

Celotex Corp. Acquires American Gypsum Co.

The Celotex Corp. has purchased control of the American Gypsum Co., with plants at Port Clinton, O., and River Rouge, Mich.

★A plant for crushing and pulverizing limestone has gone into operation near Whitewater, Kan., under the ownership of H. C. Stephens of Whitewater.

The crushing equipment at the new plant was supplied by the J. B. Ersham & Sons Mfg. Co., Enterprise, Kan.

Road-Research Board to Meet at Capital

NOV. 30 TO DEC. 3 ARE DATES

In order to provide opportunity for needed discussion of many important road and transportation problems, the seventeenth annual meeting of the Highway Research Board of the National Research Council is scheduled to be held in Washington, D. C., for four days commencing Tuesday, Nov. 30 through Dec. 3, instead of the two days that formerly were found sufficient. A large part of the time will be devoted to open departmental meetings on economics, design, materials and construction, soils investigations and roadside development.

All day Tuesday, Nov. 30, will be the open meeting of the department of soils investigations. At the opening session on Wednesday morning papers and reports relating to soils and maintenance will be presented. Wednesday afternoon will be for open departmental meetings on materials and construction, and roadside development. Thursday's meetings will include a general session in the morning on finance, materials and construction, and roadside development; and one in the afternoon on highway safety. Friday will be devoted to design and economics, a common general session in the morning and separate departmental meetings in the afternoon.

Research work on all phases of highway transportation has been quite active during the past year and the widespread activities will be reported upon and discussed.

Burial-Vault Makers Are Cited by F.T.C.

The Permanent Concrete Burial Vault Co. and Peter J. Bough, another vault manufacturer, have been cited by the federal trade commission for false and misleading advertising.

Cease-and-desist orders have been issued, whereby the two firms are prevented from using the terms "permanent", "everlasting protection", "waterproof", and "endures forever" in claims for their product or as part of their trade names.

Orders Health Survey of Industry in Utah

To determine industrial hazards to the health of workers, the Utah state health department and the U. S. Public Health Service have begun an extensive survey of working conditions in the state's industries. Coöperating are the U. S. Bureau of Mines, the U. S. Bureau of Standards and the Utah industrial commission.

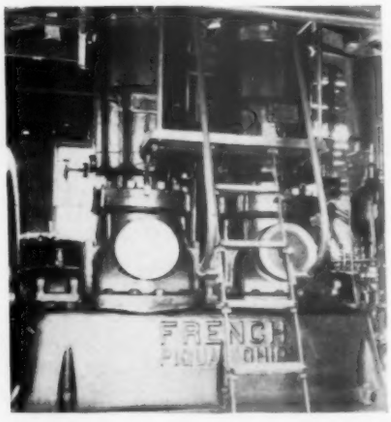
All industries will be surveyed, but the data obtained will not divulge the results as to any one particular plant or individual. Consent of industries to make the survey, including a physical examination of their employees, has been obtained.

The results of the survey will be made available to the next legislature which will probably seek to make industrial diseases compensable under the state compensation law. Such a law was sidetracked in the last legislature because of lack of sufficient data on which to base it.

Electrified throughout, this is the new crushing-and-pulverizing plant of the Raabe Stone Co. at Fort Jennings, O. The company also operates a plant at Kalida, O. Charles C. and Rudolph Raabe are the owners.

★ The Johns-Manville Corp. is erecting a 90-ft. by 80-ft. addition to its mineral-wool plant at Alexandria, Ind.

Completion is set for some time in December.



Recently installed to supply power in the plant of the Sidney Washed Sand & Gravel Co. at Sidney, O., was this 125-hp. French Diesel engine.

Will Seek Candidates' Attitude on Diversion

NEW JERSEY GRANGE GETS BUSY

Representatives of 12 organizations of farmers, motorists and other highway users, meeting at the call of the New Jersey State Grange, have adopted a resolution to ask all candidates for state offices for a declaration of their stand on diversion of automotive tax funds to non-highway purposes. During the past few years New Jersey has diverted approximately $80,000,000 of road funds. Earlier this year the state was penalized for such action by the withdrawal of $250,000 of federal road grants.

David H. Agans, master to the New Jersey Grange, characterized diversion as a "pernicious practice" and denounced the penalizing of motorists to provide funds for extravagant relief programs, saying, "It is the belief of the conference that the tremendous increase in employment in the past two years and the fact that our farmers can not secure sufficient help to harvest their crops, should be thoroughly investigated. Our worthy needy must be taken care of, but it is high time that some consideration be given to those who can work but prefer to use unemployment relief as their source of livelihood."

Builds Plant in Ontario to Make Marble Chips

Production of marble chips used in making terrazzo flooring was started late in September at Bancroft, Ontario, by the American Marble Co., Ltd., Toronto. The company has acquired options on 2,100 acres in the Bancroft region and erected a modern screening and crushing plant with a daily capacity of 50 tons. E. A. Luery is plant superintendent, and R. U. Mahaffy, general manager.

Colorado Marble Firm Enlarges Operations

Work on a new sheet-metal warehouse has been completed by the Colonna Marble Co., Canon City, Colo. The building, which adjoins the marble-crushing plant, will be used for storing ground terrazzo.

The company is working at one-shift capacity and may have to go on a two-shift basis if orders pile up. The bulk of its output is ground marble used in the production of terrazzo floors and walls.

National Crushed Stone Assn.
National Lime Assn.
National Slag Assn.
Portland Cement Assn.

WITH THE TRADE ASSOCIATIONS

National Sand & Gravel Assn.
National Industrial Sand Assn.
National Ready Mixed Concrete Assn.

NOVEMBER, 1937

Producers Hold All-Day Meeting at Syracuse

Members of the New York State Crushed Stone Assn. held an all-day meeting Thursday, October 21, at the Hotel Syracuse, Syracuse, N. Y.

The special committee appointed for that purpose reported on its progress to obtain an increase in the upper limit size of No. 1A stone in highway specifications. Installation of approved dust-control apparatus for rock-drilling work, made necessary by state law, was also described and discussed. H. H. Wagner, general manager, Pennsylvania Stone Products Assn., Harrisburg, Pa., was also present and made a talk which was enjoyed by the producers.

Lime Assn. Developing Treatise on Plaster

A comprehensive treatise on lime plaster is in the course of development by the National Lime Assn. The association has obtained the services of an outstanding authority on the subject and much of the text has already been prepared. Good photographs for use in illustrating the book are needed and lime producers are invited to furnish clean, glossy prints of appropriate views they may have or can obtain. When published, the association will have a booklet that can be used as a text in universities and colleges in their architectural courses, by trade schools, and by journeymen plasterers as a reference work.

Slag-Assn. Directors Hold Meeting, Election

Representatives of the companies that handle 85 per cent. of the annual tonnage of crushed and screened blast-furnace slag produced in the United States, attended the twentieth annual meeting of the directors of the National Slag Assn., held at Hotel Schenley, Pittsburgh, Pa., on October 7 and 8.

Throughout the sessions, which consisted for the most part of problems within the industry, there was good attendance.

The following officers were elected: President: George A. Mattison, Jr., Woodstock Slag Corp., Birmingham, Ala.; vice-president: L. E. McDermut, Illinois Slag & Ballast Co., Chicago, Ill.; secretary-treasurer: H. J. Love.

Coming Events

November 12-13, 1937, French Lick, Ind. — Annual meeting, Midwest Agricultural Limestone Institute.

November 29—December 1, 1937, Chicago, Ill. — Annual meeting, Portland Cement Assn., Blackstone Hotel.

January 17-18, 1938, San Antonio, Tex. — Annual convention, American Concrete Pipe Assn., Plaza Hotel.

January 17-22, 1938, Cleveland, Ohio. — Annual Road Show, American Road Builders' Assn., Cleveland Auditorium.

January 24-26, 1938, Cincinnati, Ohio. — Twenty-first annual convention and machinery exhibition, National Crushed Stone Assn., Netherland Plaza Hotel.

February 1-3, 1938, Cincinnati, Ohio. — Twenty-second annual convention and machinery exhibition, National Sand & Gravel Assn., Netherland Plaza Hotel.

February 1-3, 1938, Cincinnati, Ohio. — Annual convention and machinery exhibition, National Ready Mixed Concrete Assn., Netherland Plaza Hotel.

February 7-8, 1938, Chicago, Ill. — Annual convention, Cast Stone Institute, Sherman Hotel.

February 8-11, 1938, Chicago, Ill. — Annual convention and machinery exhibit, American Concrete Contractors' Assn. and National Concrete Masonry Assn., Sherman Hotel.

Legislation and Labor Problems Considered

The semi-annual meeting of the board of directors of the National Industrial Sand Assn. was held at the Palmer House, Chicago, Ill., Tuesday, October 5.

Beginning with luncheon at 12:30 p. m., and continuing through the afternoon, matters considered included Federal legislation affecting the industry, and the current situation in the industry with reference to labor relations.

Announces Additions to N.C.S.A. Membership

The Consumers Co. and Dolese & Shepard, Chicago, Ill., and the Mid-West Rock Products Corp., Indianapolis, Ind., are new members of the National Crushed Stone Assn., according to J. R. Boyd, administrative director.

Five new associate members in the manufacturers' division have also been enrolled. They include: Earle C. Bacon, Inc., New York, N. Y., Dempster Bros., Inc., Knoxville, Tenn.; The Osgood Co., Marion, O.; Peoria Steel & Wire Co., Peoria, Ill.; and Screen Equipment Co., Buffalo, N. Y.

Southeastern States to Sponsor Lime Meetings

A series of public meetings for the discussion of uses of lime in construction is being arranged by the National Lime Assn. in coöperation with members in Districts 10 and 11. Details are not yet complete but tentative plans provide for four meetings: one each in Florida, Alabama, Georgia, and North Carolina.

The probable dates are December 6 to 10, inclusive. Members in Districts 10 and 11 will be notified as soon as final details have been arranged.

The National Gypsum Co. is planning to rebuild its plaster mill at Fort Dodge, Ia., following a disastrous fire which destroyed the former plant early in October with a loss of about $200,000.

. . . Editorial . . . . . .

Trade-Union Responsibility

THE history of trade unionism is filled with accounts of various ways by which it was sought to make trade unions, once their legal right of existence had been established, powerless to accomplish the ends for which they had been organized. In England, for example, after the legality of trade unions had been fairly well fixed by Parliamentary acts between 1871 and 1875, and after there had been a practical abandonment of attempts to suppress them through the criminal law, civil suits directed at union officials resulted in decisions that in effect made acts that were lawful when performed by a single person unlawful when performed by more than one person, on the mere presentation of evidence that such acts constituted a "conspiracy to injure" the complaining employer. Even where such acts had not yet been performed, but were shown to be merely threatened or intended, the courts' power of injunction was called upon and with a degree of success that in our own country far exceeded that achieved elsewhere. Although Parliament had made trade unions immune from legal proceedings against their corporate funds, some thirty years later, in the proceedings that arose out of a strike of the employees of the Taff Vale Railway Company in South Wales, the Law Lords decided that the Amalgamated Society of Railway Servants, even though unincorporated, could be sued in a corporate capacity for damages alleged to have been caused by the acts of its officers, that it could be enjoined from performing any acts that might cause loss to other persons, and that the damages assessed could be recovered from the union's property, even if this were in the hands of separate trustees.

Those who have suffered financial loss through strikes, picketing and other trade-union activities have naturally sought relief, and the incorporation of trade unions has often been suggested as a means for bringing their officers and funds within the reach of the arm of the law. Within recent years, under the tension created by a series of serious and protracted labor conflicts, there has arisen a loud demand for Federal legislation requiring the incorporation of labor organizations. While it is recognized that such a law, if it could be enacted and if it were not nullified on the ground of unconstitutionality, would provide some advantages by establishing a legal name and residence for every trade union and would imply a right of supervision of some sort by the government, the "blessing", as some of its strongest advocates would probably designate it, is not unmixed. Corporation lawyers, who sometimes take a broader view of such matters than their clients because of their being somewhat removed from the fighting line of labor conflicts, have pointed out that incorporation, coupled with many of the drastic publicity requirements often attached to the proposals urging it, might set up new dangers affecting the legal status of employers and their relations with the public. It might call forth retaliatory demands upon employers with requirements that might seriously curtail their liberty of action and in less important ways prove irritating and embarrassing.

SOME of these lawyers believe that the plan of leaving incorporation in its present status of a purely voluntary act, as it is with business and other organizations, is best, and they doubt whether compulsory incorporation, either state or Federal, would be constitutional. They say that compulsory legislation, even if feasible, would be certain to raise counteracting demands for stricter regulation of business in related or new activities, that the union's present freedom of action would not be relinquished without a struggle that might prove to be more costly and widespread than ordinary conflicts. Even under the ever-broadening interpretation of the amount of legislation necessary for the protection of the public the government's right to compel incorporation is still limited to a few businesses, such as banking and insurance.

Incorporation of trade unions is usually thought of as a means for increasing their legal and financial responsibility, although it is diffi-

cult to see just how the mere requiring of them to obtain a government charter would have that effect. Responsibility in a legal sense is determined largely, and in many cases entirely, by the ability of the losing party to pay the damages assessed. This resolves itself into questions of the tangible property owned by him and the means that are available for seizing it. An insolvent trade union, like an insolvent business, acquires no new assets and certainly no new financial value through the mere act of incorporation. Whatever assets an unincorporated union may have are as accessible for the satisfaction of a judgment as are those of an incorporated union.

THE fulfillment of contractual obligations, which becomes the point of major interest, when, for example, a strike is called in violation of an existing trade agreement, would not, it seems, be rendered more certain by the mere fact of incorporation. Just as acts are, in the last analysis, performed by individuals, so must the remedies exacted for their nonperformance be exacted from and paid by individuals. Incorporation would not in itself materially alter the responsibilities which individuals have for the fulfillment of contracts, either through the performance of promised acts or through the avoidance of forbidden acts. Indeed, incorporation might weaken the plaintiff's chances for recovery by shifting the burden of payment from union officers, who might have funds that could be attached under judgments rendered against them, to corporate bodies that might, and probably often would, be actually or practically insolvent. Men who can not by law be compelled to work as individuals seemingly can not be compelled to do so merely because they belong to a labor organization, and their duty to work unwillingly certainly can not be increased by requiring that organization to incorporate under state or Federal laws.

The demands for trade-union incorporation have often included requirements for the publication of financial statements, showing the sources of revenue and the purposes of expenditures, the salaries of officers, and other information which few, if any, employers would be willing to provide, if similar demands were made of them. Such a requirement made of employers, preposterous as it might appear, might be quite as defensible on the score of public policy as such a demand made of a trade union. It might, with as much or as little justice, be made of a trade association, a coöperative organization, or of any other group created for group objectives.

The incorporation of a trade union would carry no guarantee whatever, and hardly any reason to expect, that trade-union activities would be elevated to a higher plane of regard for law or the public interest, or that they would be directed by men with any different—in the sense of higher—standards of conduct than those current among accepted labor leaders. The latter would still be elected by member votes and these would be counted, or not counted, just as they are in the absence of incorporation. The incorporation of a business enterprise is no assurance that its officers and directors will be either competent or honest, nor that the interests of the stockholders will be conserved rather than imperiled or wasted. In neither case would protection against abuses, freedom from tyrannical administration, absence of peculation, or prevention of the breach of contracts be insured by the mere formality of legal incorporation. In the matter of fulfilling trade agreements between employers and trade unions the most powerful weapon for compelling performance still resides in the power of expulsion or suspension of charters held and often exercised by the heads of parent unions, and the sense of responsibility which these men feel—both in their determination to serve their members and in their desire to preserve the integrity and standing of the trade-agreement principle—can not be enhanced by requiring trade-union incorporation.

To recognize these facts is not to resign oneself to a complete reliance on personal integrity, although this lies at the bottom of every type of fair agreement. Laws exacting heavier penalties for the infraction of the rules of fair and honorable conduct should, and doubtless will, be enacted, but their effectiveness will not depend upon such a legal fetish as the incorporation of either trade unions or business enterprises.

THERE is no short-cut to industrial peace. Men who feel aggrieved, whether employers or employees, will continue to plead and strive for the type of legal protection and assurances which seems to them to be essential to the attainment of the type of justice which fits their different definitions of it. Legislation may, and very probably will, soften the strife by reducing the number of causes of friction, but effective laws will not be passed unless both sides are ready to make small concessions in favor of large gains. Compulsory incorporation of trade unions would not provide the securities its advocates expect, nor would it tend to improve the relations between employers and employees. And on no other grounds can it make any reasonable claim to serious consideration.

View of the plant at Evansville, Pa. The building at the extreme right is the coal mill. The large-light-colored building near the center of the picture is the rebuilt finishing mill.

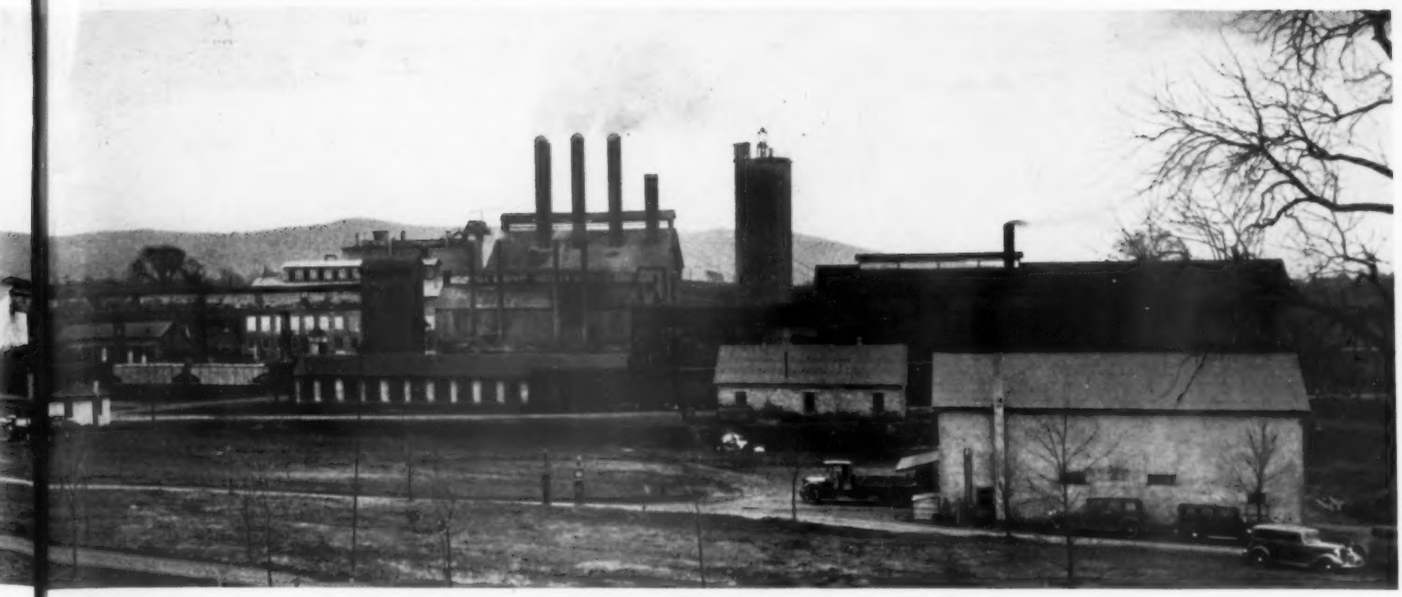
CLINKER - GRINDING D
AT ALLENTOWN'S E

THE dry-process plant of the Allentown Portland Cement Co., at Evansville, 9 mi. east of Reading, Pa., was built by the Fuller Engineering Co., construction having been begun in 1908 and completed in January, 1910. A consistent practice of modernization and replacement was expanded into a comprehensive rebuilding program in 1935. In that year three reinforced-concrete rock-storage silos were built from which raw-mill feed is withdrawn and proportioned by weighing feeders. At the same time the two raw-material blending silos and their pumping systems were added, two air-separators and a dust-collector were installed in the raw-material grinding department, and an air-separator in the clinker-grinding department.

In 1937 the clinker-grinding department was entirely rebuilt. The two original clinker-finishing tube-mills were moved to the raw-material grinding department. Two new-type center-discharge mills, one additional air-separator, two dust-collectors, together with incidental conveyors, elevators, etc. were installed in this de-

The clinker-mill room. Clinker feeder and second mill are in the background.

Air-separator arrangement. One of the pneumatic pumps which deliver cement to storage is in the foreground. All starting switches for mill-room units are on the panel at the right with the exception of the starting mechanism for the tube-mill motors.



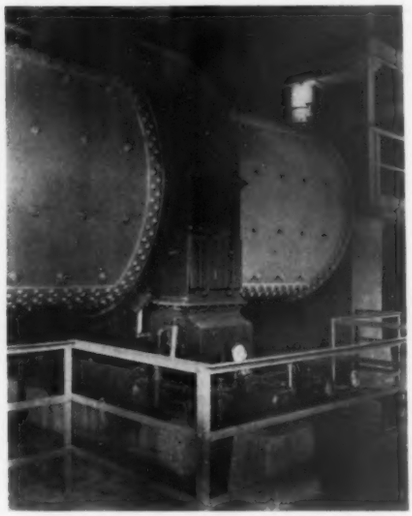
G DEPARTMENT REBUILT 'S EVANSVILLE PLANT

By
W. E. TRAUFFER

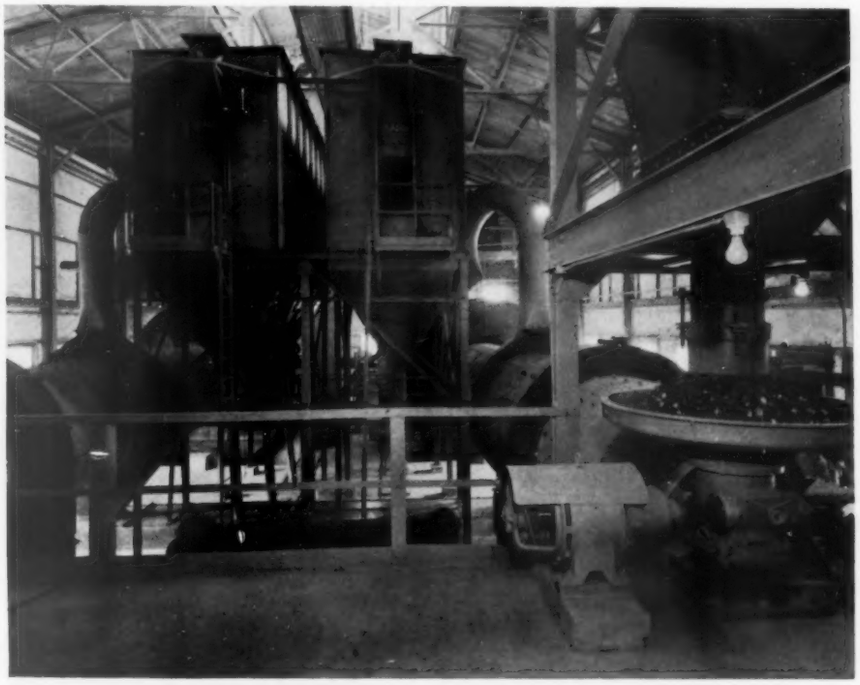
partment. The raw-material grinding department was substantially changed. It is with the latest improvements that this article is chiefly concerned.

The company's original deposit, which still supplies most of the plant's needs, is at the extreme western end of the Jacksonburg limestone, from which the plants in the Lehigh Valley are supplied. This is a graphitic argillaceous limestone with extremely fine-grained crystallization and a relatively low alumina content. Like most other plants in the valley, the company's plant for many years purchased some limestone to corect its composition. In 1933, however, high-grade limestone was discovered within 3 mi. of the plant, near improved roads, and the company accordingly developed the Kirby quarry, which now satisfies its requirements for high-grade stone, and with a substantial reduction in production costs. A complete description of this deposit and the commercial crushed-stone plant there was published in the July, 1934, issue of PIT AND QUARRY.

In the main quarry a new level has been opened to make available a better grade of limestone. Much of this level is above composition in lime, and,



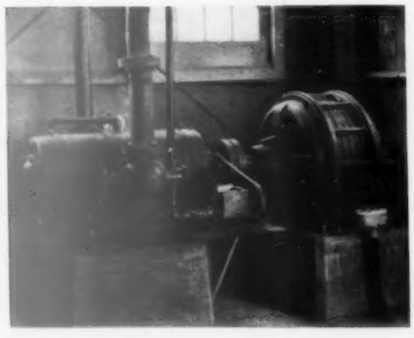
Details of the shoe-bearings and the oil-supply system. The high-pressure pump is the unit with the two-pressure gages at the extreme right. The small motor-driven centrifugal unit on the footing in the foreground is the oil-bath-circulating pump.



A view from the feeder platform between the mills.

Raw-material grinding department. The pipe-line rising from the left of the separator and suspended below the roof chords is the transport line leading to the blending silos.

when developed fully to the original face, the new face will approximate correct composition. Blast-hole drilling and blasting methods follow customary procedure. Cars are loaded by an electric shovel and hauled to the plant incline, where they are hoisted to the plant. Reduction is accomplished by a gyratory primary crusher and two gyratory secondary crushers. The stone is then passed through three rotary driers which use waste heat from the kilns. A Pennsylvania hammer-mill further reduces the dried rock, which is then discharged to a bucket-elevator. A drag-conveyor distributes this rock into two of the three new storage silos. These silos are 30 ft. in diameter and 75 ft. high.



Rotary air-compressor which supplies the pump shown in the view on page 48.

The Kirby limestone for the cement plant is crushed to 2 in. minus at the quarry, and is hauled to the cement plant by a Mack truck with a Freuhauf tralier. The stone is discharged into a hopper and is then passed through the same driers, hammer-mill and conveying system described in the aforementioned article into the third storage silo.

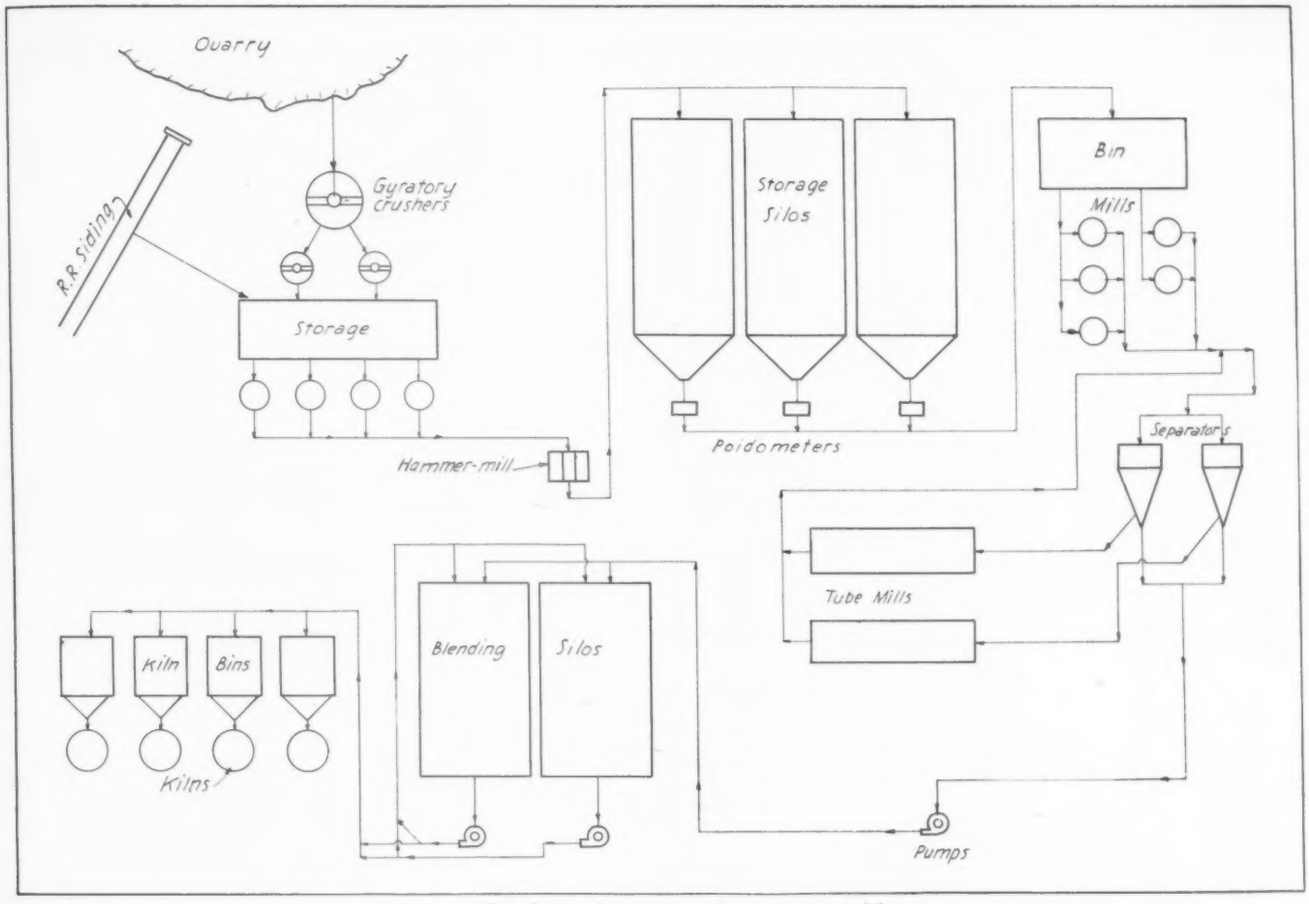
Under each of the three silos is a Schaeffer Poidometer. These three machines proportion the stone as desired on a tunnel belt-conveyor. The rough-blended stone is discharged into a drag-conveyor feeding an elevator which discharges it into bins feeding the five 57-in. Fuller mills. Screw-conveyors feed the product of these mills to the elevators discharging into two 16-ft. Sturtevant air-separators. The separator tailings go to the two 7-ft. by 26-ft. Traylor tube-mills, whose product is discharged into the Fuller mill-separator conveyors and is thereby recirculated through the separators.

The fine separator product is taken by an 8-in. Fuller-Kinyon low-pressure pump, which discharges it into the two 30-ft. by 90-ft. raw-material blending silos. The pump is directly and individually supplied by a new single-stage Fuller rotary air-compressor. The Fuller-Kinyon automatic blending system is used. Under each silo is a 6-in. Fuller-Kinyon Type E pump, converted to use 30-lb. air pressure. While one of these pumps circulates and blends the materials in the silos, the other pump feeds the four kiln-feed bins. These pumps al-

Raw-material blending silos. The suspended pipe-line is a continuation of the one shown in the picture at the upper left.

ternate automatically at 4-min. intervals, circulating and feeding in turn. The bins are fed in rotation. The control panel is equipped with switching mechanism which is employed to reserve one silo and one or more kiln bins for mixtures for special cements; the branches of the system, however, continue under automatic operation.

The kiln room includes four kilns, three 8 ft. by 125 ft. and one 9½ ft. by 8 ft. by 125 ft. The coal used for firing the kilns is prepared in the coal mill which was built in 1908. Except for a 5-in. low-pressure Fuller-Kinyon pump installed several years ago, no changes have been made in this department in recent years, as it will soon be rebuilt.

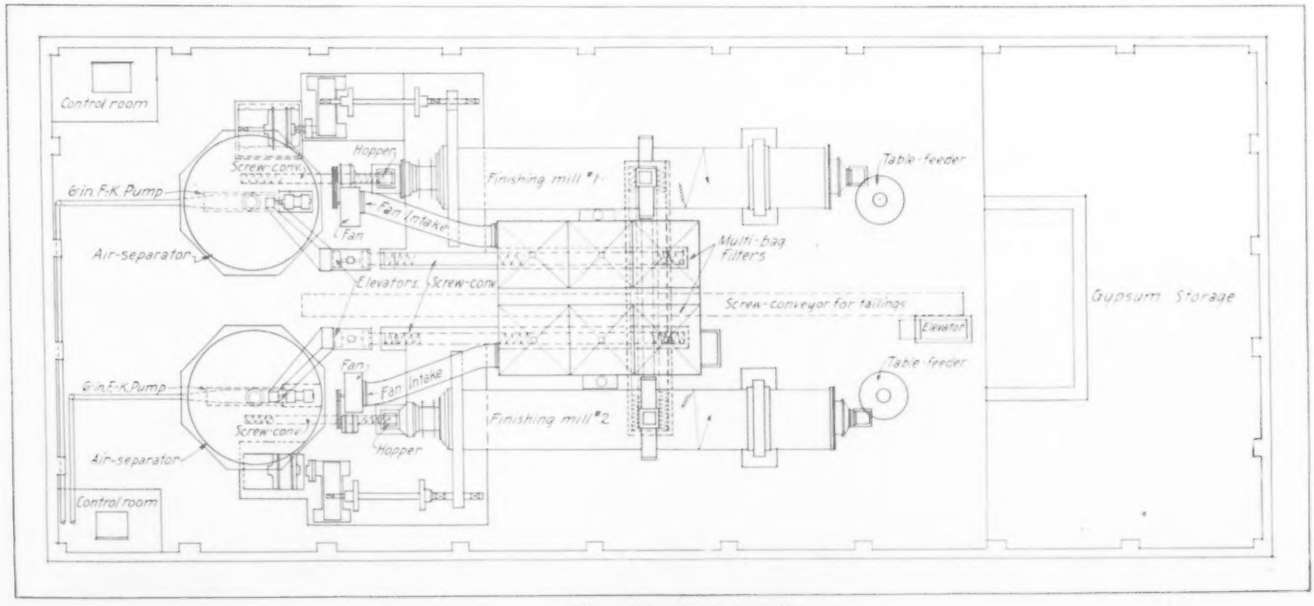


Flow-sheet of operations from quarry to kilns.

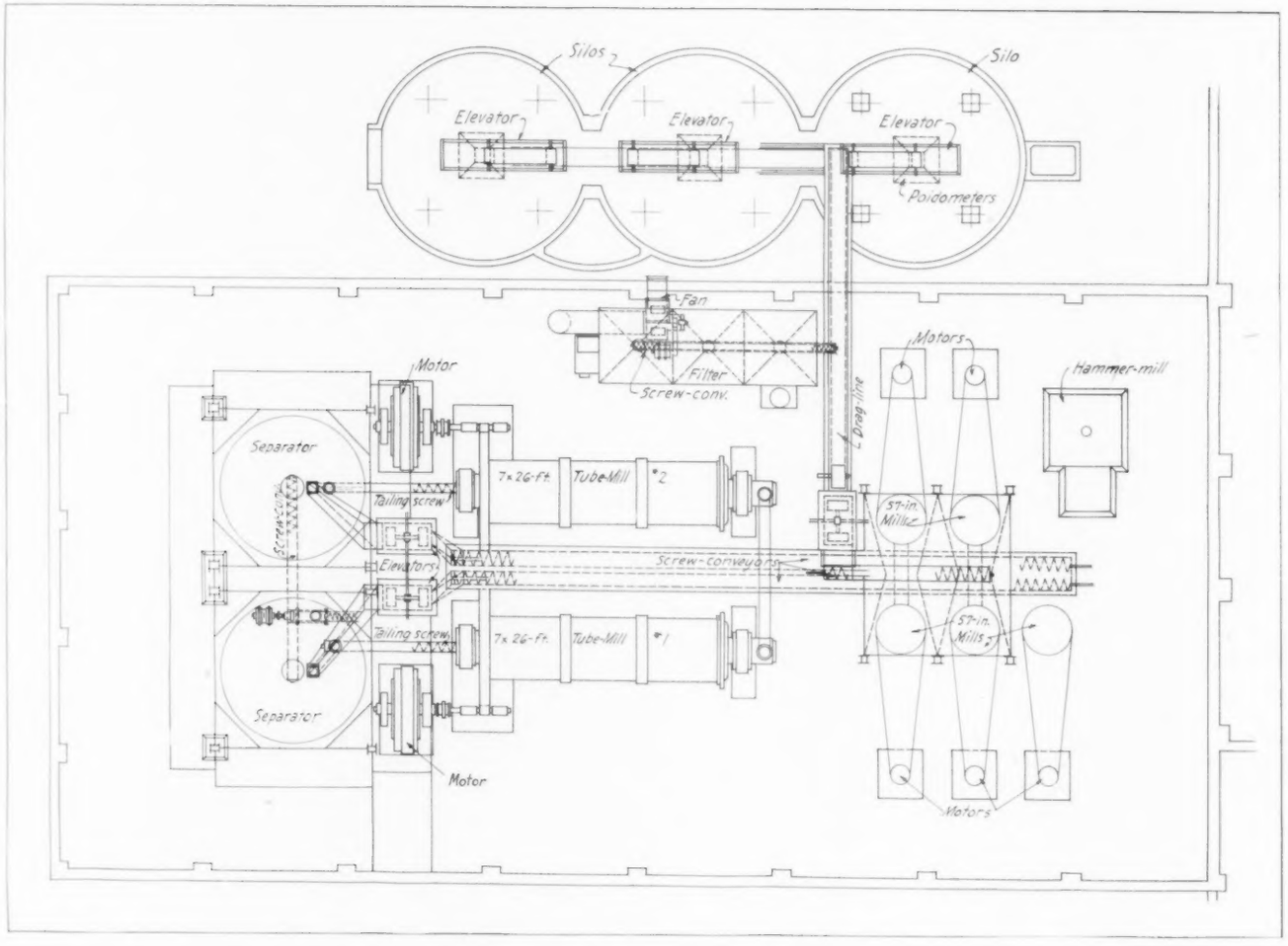
The clinker is discharged from the kilns into a pit, from which it is picked up by a bucket-elevator and dropped into four 6-ft. by 60-ft. rotary coolers. The clinker is discharged from these coolers on a belt-conveyor feeding a Syntron automatic scale. An elevator then drops the clinker on a belt-conveyor which has a tripper that can discharge it either into a 600-bbl. clinker-storage bin or on a storage-pile of 100,000-bbl. capacity. A drag-chain conveyor reclaims the clinker from storage to an elevator, which discharges it into the clinker bin.

Gypsum is purchased in the desired size and is stored and fed to a 300-bbl. bin next the clinker bin. Under each of these two bins is a Schaeffer Poidometer for proportioning the clinker and gypsum as they are discharged in a bucket-elevator. The mixture is split into two 300-bbl. steel mill-feed bins.

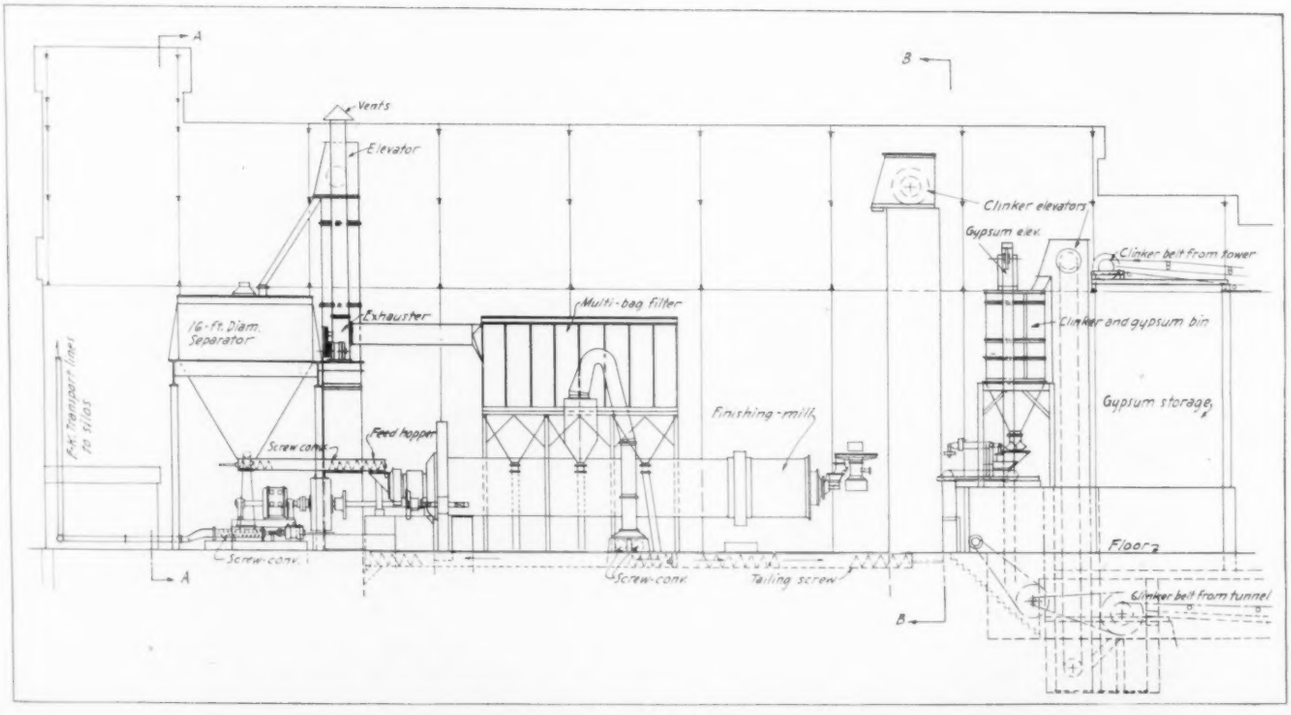
Two F. L. Smidth table-feeders draw from these bins and feed the two 7-ft. by 46-ft. F. L. Smidth finish-grinding mills. These are 3-compartment machines of a new type with



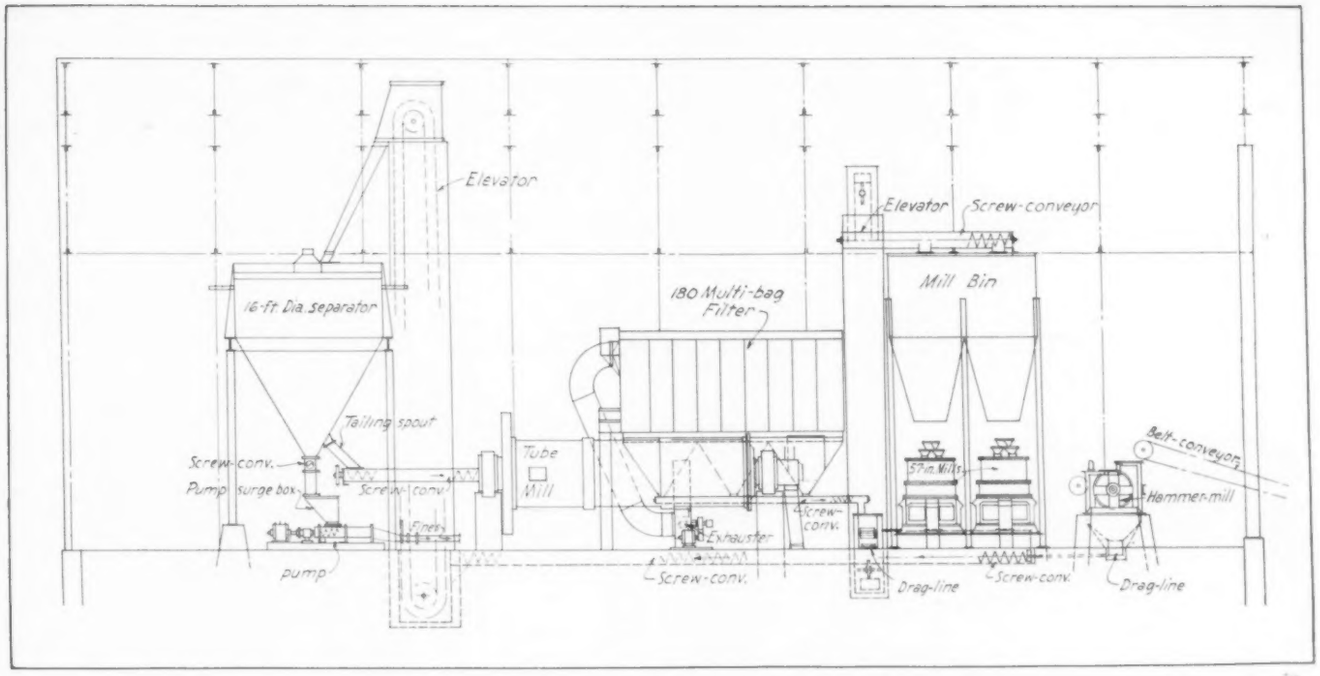
Plan of the finishing mill.



Plan of the raw-grinding mill.



Longitudinal elevation of the finishing mill.

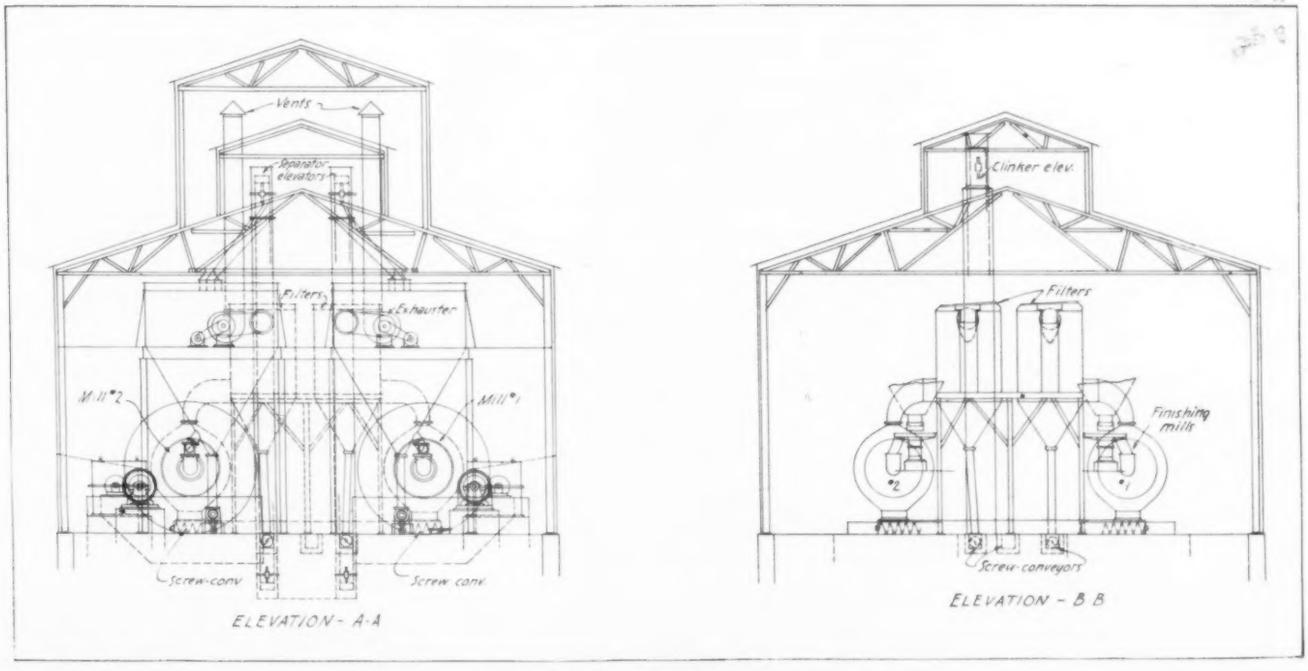


Longitudinal elevation of the raw-grinding mill.

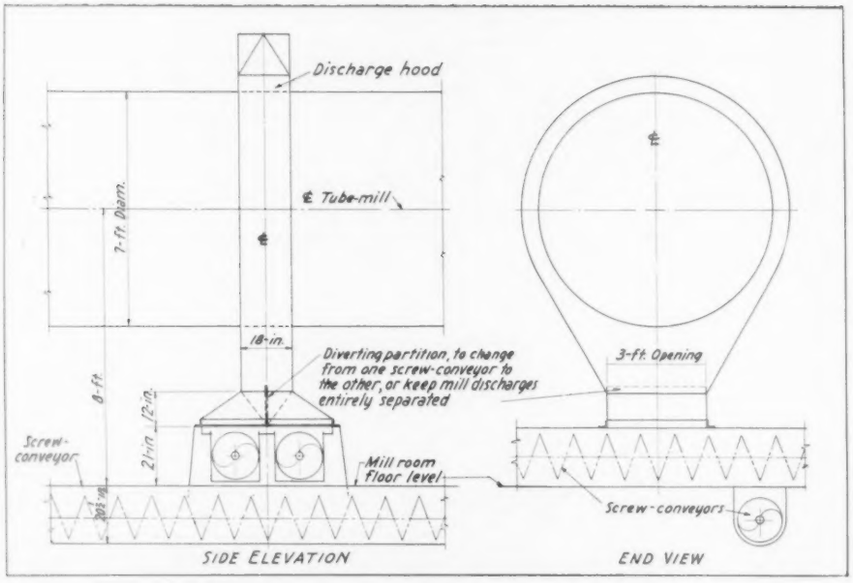
center discharge. The mixture is fed into a compartment 13 ft. 1½ in. long, which is loaded with 17,300 lb. of 3½-in. balls, 20,000 lb. of 3-in. balls and 9,000 lb. of 2½-in. balls. The material passes through 5/16-in. slotted openings into the second compartment, which is 7 ft. 10½ in. in length and is loaded with 4,400 lb. of 2-in. balls, 13,000 lb. of 1½-in. balls and 9,000 lb. of 1¼-in. balls.

The material is discharged from the second compartment of each mill to individual separating circuits. From each mill a 16-in. by 10-ft. cross screw-conveyor feeds a 16-in. by 40-ft. screw-conveyor running parallel to the mill. This screw discharges the material into a 50-ft. chain-bucket-elevator which drops it into a 16-ft. Sturtevant separator over the end of the mill. The tailings from each separator are discharged into the third compartment of each mill through the trunnion bearing at that end. The third compartment is loaded with 37½ tons of ⅝-in. by 1-in. Cylpebs. The product of this compartment is discharged into the same screw-conveyor in the circuit feeding the separator. In each mill compartment are annular slotted rings spaced 30 in. apart, the first, second and third compartments having 4, 2 and 8 of these rings, respectively.

As stated above, one end of each mill is supported on trunnion bearings. The clinker-feed end is supported on a tire placed about two-thirds of the way from the feed end of the first compartment. This tire rests on self-alining two sliding-shoe bearings



Sectional elevations of the finishing mill.



Diverting partition in tube-mill in finishing department.

Another view in the raw-material grinding department, showing the separators and pneumatic pump.

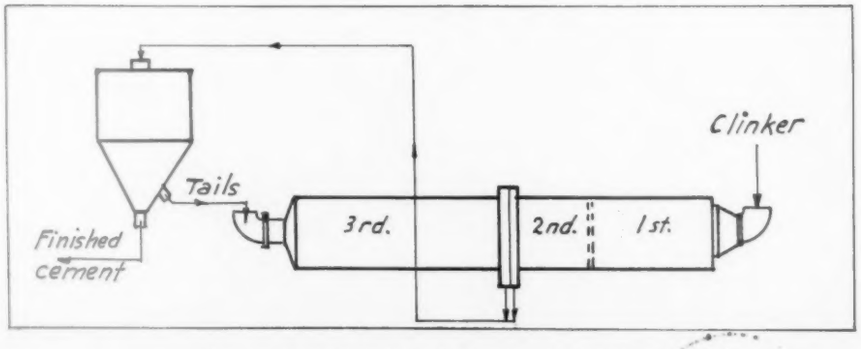


Diagram illustrating the grinding circuit as installed.

which are in approximately the same position as the rollers ordinarily used on such mills. Before the mill is started a high pressure pump forces oil through openings in the bearing surface of each shoe, lifting the tire on an oil film. As soon as the mill is in operation the oil pressure is shut off and further lubrication is supplied from a pan through which the tire passes. This bearing is said to be the first of its type in this country and a power saving over the roller-type of bearing commonly used is claimed.

These mills are driven through F. L. Smidth gear-reducers by 900-hp. General Electric synchronous motors designed specially for them. These motors are operated from an automatic control board and have four speeds which engage automatically in sequence after the starting push-button switch is closed, thus graduating the starting load.

The grinding and separating circuit described above is one of three optional circuits which can be used. Additional circuits can be developed if ever needed.

The fine product of each separator is discharged into one of two 6-in. Fuller-Kinyon pumps. These discharge the cement into the old 100,000-bbl. stock-house or into six 30-ft. by 90-ft. storage silos which, with their interstices, also have a combined capacity of 100,000 bbl. Two 7-in. Fuller-Kinyon portable pumps on movable bases transfer the cement from these silos either direct into bulk-cement cars or into bins over the four 3-tube Valve Bag packers in the pack-house.

The pipe-lines from the pumps to the storage silos are water-jacketed and this lowers the temperature of the cement 40 deg. F. in transit.

The equipment in the raw-material grinding department formerly consisted of 15 Fuller 42-in. mills which were connected to the same two separators now used.

The new clinker mills are producing cement with a fineness of 98 per cent. through 200-mesh and a specific surface area of 1,750 sq. cm. per g. Each mill is now producing 100 bbl. per hr. of this material, and a capacity of 120 bbl. is expected after final adjustments are made. Test runs have also shown that high-early-strength cement with a specific surface area of 2,500 or more sq. cm. per g. can be made.

Dust-collectors are used wherever needed to eliminate dust and to save valuable fine material. A 3-tank cylindrical type Norblo dust-collector is connected to the hammer-mill in the raw-material crushing department. A Dracco 3-compartment dust-collector

(*Continued on page 63*)

Analyzing the Various Stipulations of a Recent Labor-Union Contract

REPORTS received from a number of nonmetallic-mineral producers in the last two years indicate that several concerns have been led by the pressure of circumstances to sign labor contracts that have already proved to be more restrictive than the situation required. Usually labor trouble comes at times when employers are least able to pause for deliberation. Production schedules must be met, and the fear of even a temporary enforced shut-down sometimes results in the granting of greater concessions and in the acceptance of more burdensome stipulations covering hours, regularity of employment and other working conditions than would have been necessary had more time been available for study and discussion.

Alert trade associations have rendered their members a great service in acting as clearing-houses for the exchange of information and in disseminating facts about unwise labor contracts and in cautioning their members against the hasty signing of agreements without proper consideration. Some organizations have invited their members to submit proposed agreements to them for review and comment, in a desire to attempt to inject into labor-contract writing a greater degree of uniformity and a larger measure of self-protection for the employer.

Appended to this article is a copy of a labor contract signed by a prominent sand-and-gravel producer, a member of the National Sand & Gravel Assn. It covers two craft unions of a local building trades council, one the hoisting engineers' union, the other the common laborers' union. In commenting on this agreement, V. P. Ahearn, executive secretary of the association, said:

"The circumstances surrounding the execution of this contract were that the company in question was confronted with the inevitability of a boycott unless it reached an agreement with the craft unions. In this case, the facts did not disclose any demand from the employees themselves for recognition of the unions by the company. The same comment applies almost without exception to the majority of the contracts with labor unions entered into by member companies during the last eighteen months. It seems quite clear now that the labor problem in our industry, wherever it exists, is an external and not an internal force.

"Many member companies market their products in metropolitan areas where building-trades councils are in control of the sites of construction. When these councils discover that the boycott threat will be effective, they have generally proceeded without any regard to the Wagner Act and have sought agreements directly with company executives without, in most instances, taking the time or the trouble to enroll employees in their respective unions before presenting their demands for a contract. This condition warrants all members in closely examining their markets and the distribution of their sales, and while the Wagner act is often only of academic interest, the fact nevertheless remains that no union has a right to present any demands to a business organization until it has first been successful in securing the membership of employees. Indeed, no company has the right under the Wagner act to negotiate with unions unless those unions represent their employees. To sign a contract without such representation might reasonably be held to be interference by the company with free selection of union affiliation by its employees—a violation of the Wagner act.

"We have recommended to member companies that contracts with unions should be brief and specific. For that reason we might make the observation that Article I of this contract is extraneous phraseology without any real purpose. It is not overlooked, of course, that this article effectively establishes the closed shop, although Article II seems to deny that purpose. It is believed, however, that the principal purpose of Article II is to protect the right of present employees of the company to join the union, thus restraining the union from demanding of the company that all old employees be discharged and that men be used who are selected by the union.

"It is important, in respect to the closed-shop issue, to recall that the contracts signed by the automobile and steel industries contained a specific prohibition against the closed shop, the companies in each case agreeing to recognize the union only to the extent that it represented employees. When the closed-shop demand is supported by a potential-effective boycott, employers in our industry may have little if any choice, but the closed shop should be seen to be what it really is—the most oppressive form of private monopoly which requires a man anxious to work to take out a license with the union before he can earn his livelihood. The closed shop clothes the union with the authority of life and death over employees; it exposes them to the necessity of paying dues and assessments without end, and it places them at the mercy of a capricious and arbitrary union official. Our industry, in the light of these conditions, should not accept a closed shop in any instance without the most mature consideration.

"Article III is highly commended. It is unfortunate that other contracts signed by member companies have not contained this same control over company management. Only two states, Arkansas and Mississippi, fail to provide a workmen's compensation insurance. Since compliance with the law is not discretionary, we see no reason for writing into labor agreements a provision such as Article IV.

"A recent letter to member companies, commenting at some length upon labor matters, called to the attention of members that our industry required special consideration in the fixing of hours of employment. There are three things which distinguish the sand-and-gravel industry in this regard: (1) highly-seasonal characteristics of the business; (2) peak-load variations; (3) interruption due to adverse weather conditions. Therefore, a variable program for controlling hours of employment in our industry is indispensable, and a daily

limitation should be avoided at all cost. At the very least, there should be a maximum work week, without daily limitations, say of 48 hr. In fact, the control might well provide for a maximum work month, and a figure of about 200 hr. is suggested. This will give the regular employees the maximum amount of total wages and will not require the company to deprive old employees of full-time employment in order to make room for new men without any previous stake in the company.

"This contract provides for a daily as well as for a weekly limitation, but we are informed that the unions would not yield in their insistence upon a provision for daily control. Other parts of Article V are commended to member companies, except that the provision for time and one-half goes beyond the [N.R.A.] Code stipulation, which was for time and one-third for all hours worked in excess of a weekly limitation.

"Article VI covers a very critical point in any industry, namely, the training of apprentices. The rates of pay provided for in Article VII seem unduly high in comparison with the prices prevailing in other localities. They are probably as high as any scale in our industry in the country, notwithstanding the fact that the city in which the member company is located is not grouped among the cities ordinarily held to represent the highest cost of living.

"Article VIII seems, on first glance, to be totally unwarranted, particularly since there are appropriate state laws to cover the issuance of checks without sufficient funds on deposit. However, it is understood that union member in that locality in question have had unsatisfactory experience with other companies in respect to collecting their wages when they are paid by check. Article VIII is then held by the unions to be necessary and without any reflection on the company signing the contract.

"Article IX is typical and seems to require no special comment. Article X is recommended as a reasonably-safe means of avoiding violent disputes, and Articles XI, XII and XIII are repetitions of similar provisions in the majority of contracts signed with craft unions."

Agreement

THIS AGREEMENT made and entered into this .....day of ....., 19.., by and between.....COMPANY, a corporation, and..... COMPANY, a partnership, both of....., ..., engaged in the business of production, distribution, and/or marketing of stone (in any form), sand and gravel; and of manufacturing and hauling of ready-mixed concrete; and of hauling and/or marketing of building materials, hereinafter referred to as the COMPANIES: and the..... BUILDING AND CONSTRUCTION TRADES COUNCIL, INTERNATIONAL UNION OF OPERATING ENGINEERS LOCALS Nos....., HOD CARRIERS BUILDING AND CONSTRUCTION LABORERS LOCAL No....., all of which are affiliated with and members in good standing of the American Federation of Labor, their officers, agents, and members, hereinafter referred to as the UNIONS.

Article I

Object

Because both the Companies and the Unions desire to establish a relationship of coöperation whereby the mutual interests of both may be promoted to the highest degree of efficiency in the sand-and-gravel, stone, building-materials, and ready-mixed-concrete industries, stabilize employment, agree upon wage rates and conditions of employment, and do away with strikes, boycotts, lockouts and stoppage of work, it is agreed that the Companies will employ only Engineers who are members in good standing of International Union of Operating Engineers Locals Nos. ....., and laborers who are members in good standing of Hod Carriers Building and Construction Laborers Local No. .....; that regulations will be observed to discipline those who may be guilty of conduct unbecoming an engineer or union laborer; that the Companies and their products will be advertised through the usual channels as being fair to union labor, and that the Unions will use their good offices on behalf of the Companies in every honorable manner.

Article II

Union Recognition

The Unions are recognized as the collective-bargaining agency for those employees of the Companies who are members of the Unions. Present employees shall have the right to become members of the Unions without interference, restraint, or coercion, direct or indirect, by either party to this agreement.

Companies shall not collect dues or initiation fees for the Unions and shall not in any way act as the agent of the Unions. The Unions will not interfere with the Companies' employees during working hours except that the business representative may consult with men on the job when necessary, at no time exceeding a period of ten minutes.

Article III

Company Management

The Companies specifically reserve the right to sell and service any and all of their customers at any and all times at the Companies' discretion, and the Unions specifically agree to the above, and further agree that at no time during the life of this contract will they (the Unions) interfere, restrain, or coerce, directly or indirectly, the Companies or any of their customers in any manner to prevent the Companies' doing business in their usual way.

In all cases, and at all times, the Companies reserve the right to select the man best skilled for the particular work, and the right to use their judgment in this selection; and the Companies also reserve the right to promote or demote men employed in one classification of work to a classification carrying a higher or lower rate of pay, when, in the judgment of the Companies, upon one hand the qualifications of the employee are satisfactory and the employee has earned his right to promotion, and upon the other hand the circumstances justify demotion or discharge.

It is distinctly understood and agreed by the Unions that the officers of the Companies reserve the right of management at all times, and that they may select, in case of reduction of forces, those members of the Unions who are in their estimation the best qualified to continue during said reduction of forces. The Companies also reserve the right and the Unions hereby expressly agree, of making such addition in forces as they see fit, as additional forces are put back to work.

Article IV

Compensation Insurance

The Companies agree to carry workmen's compensation insurance for the protection of their employees.

Article V

Working Hours and Rules

The maximum number of hours any employee (*i.e.*, all employees of the Companies other than clerks, timekeepers, watchmen, foremen, superintendents, truck mechanics, and office employees) may work at the rate of compensation herein established, shall be 48 hr. per week, and not in excess of 8 hr. in any one day. The Companies reserve the right to control the starting time of the work day of their employees.

Employees shall receive one and one-half times the regular rate of compensation herein established for all time worked in excess of the maximum daily hours herein provided, except that they shall receive one and one-half times the regular rate of compensation, Labor Day excepted, for production or delivery work on Sundays and legal holidays. The observed holidays shall be: New Year's Day, Decoration Day, July 4, Labor Day, Thanksgiving Day, and Christmas Day.

No weekly, monthly, or yearly employee of the Companies who is a member of the Unions shall lose time because of the legal holidays listed above, and when required to work on any of those holidays, shall be paid one and one-half times the usual scale of wage as herein agreed. All labor performed by members of the Unions on Sundays and in excess of 48 hr. a week shall be paid for at one and one-half times the established scale rate.

The Companies specifically require and the Unions agree that at all times the members of the Unions who are operating equipment for said Companies will make all necessary maintenance repairs, grease said equipment in the morning, fill gasoline tanks, and have machines ready to operate at starting time, at no additional cost to said Companies. Emergency repairs shall be paid for on the regular scheduled rates of pay and not on an overtime basis.

Article VI

Apprentices

In order to maintain a sufficient number of skilled mechanics in the industries covered by this agreement, the necessity for the employment of apprentices is hereby recognized and the employment and proper training of as many apprentices as is reasonable and practicable shall be encouraged and undertaken by the Companies and the Unions, Firemen, oilers, and helpers under proper supervision of the engineers and under the instructions of the Unions are and shall be the apprentices and they shall be given an opportunity by the Companies to operate under the supervision of the engineer whenever time and opportunity avail. An apprentice who is being employed on operator's or engineer's work for the Companies shall receive the apprentice scale of wages herein set forth for such work.

Article VII

Rates of Pay

The rate of wages to be paid by the Companies to members of the Unions employed by them shall be as follows:

For operator of shovel and shovel-rigged

equipment irrespective of their motive power, hoe type, crane type, drag-line type, dipper-stick type, Monahan machine and derricks, locomotive cranes, and all dredges, the rate of wages shall be:

$ 1.25 an hour on the day pay basis
54.00 a week on a weekly basis
52.50 a week on a monthly basis
51.00 a week on a yearly basis

For operators of all portable and hoisting engines, concrete mixers and mixing plants, air-compressors, cableways, clam-shell buckets, truck cranes, pile drivers, locomotives, rollers, back fillers, trench machines, connecting machines, and all other types of cranes, crawler tractors of over 30 hp., blade machines, and bulldozers irrespective of their motive power or size, and pumps having a discharge of 4 in. or more, the rate of wages shall be:

$ 1.00 an hour on the day pay basis
43.00 a week on a weekly basis
41.00 a week on a monthly basis
38.50 a week on a yearly basis

Firemen, oilers, and helpers on all equipment of ½ cu. yd. or over shall receive the following rate of wages:

$ 0.85 an hour on the day pay basis
36.00 a week on a weekly, monthly, or yearly basis

Getting up steam and greasing up in the morning, filling gasoline tanks and making machine ready for operation at starting time is the fireman's and oiler's work and is included in this rate.

For pit labor, crusher feeders, elevator pit men, warehouse labor, scale floormen, cement-car unloaders, teamsters (Fresno and/or slip work), the rate of wages shall be:

$0.62½ an hour on the hourly daily basis
28.00 a week on a weekly basis
26.50 a week on a monthly basis
25.50 a week on a yearly basis

The Unions specifically agree that during the life of this agreement none of their members will accept employment from any other employer at a lower rate of pay for similar work or under a different schedule of working hours than herein established; and in the event of a general decline in the wages of labor or hours of work, the Companies will immediately benefit from such decline.

ARTICLE VIII
Payment of Wages

The Companies shall make all payments of wages due in lawful currency, or by negotiable check therefor, payable on demand. Wages and salaries of employees shall be paid at least twice a month.

The Companies agree that if at any time they pay a member of the Unions with a check and do not have sufficient funds in the bank to meet said check, this shall constitute cause of stoppage of work upon the information's being transmitted to the Unions' representative, and that there shall be no resumption of work until a sum not less than the expense incurred in collecting the amount due and the full amount of the check involved have been paid. Such failure to have sufficient funds for payment of check when presented shall constitute forfeiture of further right of the Companies to pay by check the Unions' members employed by them.

Any employee who quits or is discharged shall be paid in full. No employee shall leave the job by quitting unless the Unions have properly relieved him by another qualified member of the Unions.

ARTICLE IX
Employment

Any employee member of the Unions requiring relief for sickness or for other just cause must secure such relief through and with the aid of the office of the Unions. The Companies shall have the right to select such relief employees from among those members of the Unions unemployed and registered in the Unions' offices.

Whenever the Unions fail to furnish a sufficient number of competent men affiliated with the Unions to meet the needs of the Companies, the Companies shall hire such additional men as may be required to meet their needs, regardless of their affiliation or non-affiliation with the Unions. It is distinctly understood and agreed by the Unions that such additional employees shall be allowed to work without interference, restraint, coercion, or molestation by any member of any Union affiliated with the American Federation of Labor, and that they shall not be required to join a union or pay dues, assessments, or permit fees to any union. Such additional employees shall be released at the end of the day's work following the Unions' furnishing the number of qualified men required by the Companies. The Unions agree to maintain an office with telephone service available from the hours of 8 a. m. to 5 p. m. to meet the above requirements, and in addition to give night telephone numbers of all business agents with whom Union members are registered, so that in case of emergency the Companies may contact same during the evening or night. Failure of the Companies to call the office or officers of the Unions does not permit the placing of non-union men on work under this clause.

ARTICLE X
Disputes

Should any dispute arise during the period of this agreement as to the performance in good faith of this agreement which can not be settled by the Company concerned and the representatives of the Unions, the matter shall be referred to a joint committee consisting of six members, three to be appointed by the Company and three to be appointed by the Unions. If the joint committee fails to effect a satisfactory settlement by a five-to-one approval, the matter shall be settled by arbitration, three representatives of the Companies to appoint a party not a member of the Companies and the Unions to appoint a party not a member of the Unions, and the two parties so appointed to select a third party not a member of the Companies or the Unions, which shall constitute a Board of Arbitration, the expense of which shall be assumed equally by the Company and the Union. In the event the two parties can not agree upon the third party, a federal judge presiding in the vicinity where such controversy occurs shall be requested to appoint the third member. The board of three thus constituted shall consider the complaint and render its decision within 15 days by a majority vote, such decision to be final. Pending the settlement of all differences and disputes in the above manner there shall be no strikes, lockouts, or suspension of work on account of any such differences or disputes.

ARTICLE XI
Jurisdictional Disputes

Union engineers and apprentices shall be employed on all of the Companies' equipment irrespective of motive power, and it is specifically understood and agreed by the Companies and the Unions that all jurisdictional disputes shall be settled by the National Board of Jurisdictional Awards, whose decision shall be final.

ARTICLE XII
Duration of Contract

This agreement shall remain in full force and effect until December 31, 1937, with the option of the Companies to renew upon authority of their board of directors; and thereafter from year to year until terminated at the option of either party after three months' written notice.

ARTICLE XIII
Effective Date

This agreement shall be effective when signed by the Companies hereinbefore mentioned and the duly appointed and elected officials of the Unions and shall remain in effect as provided in Article XII. It is further provided that this agreement may be changed or altered at any time by the mutual consent of the Companies and the Unions.

Lime Output Higher; Price Shows Decline

Lime sold or used by producers in the United States in 1936 amounted to 3,749,383 short tons valued at $26,933,719, according to figures compiled by the United States Bureau of Mines from reports furnished by lime manufacturers. This represents an increase of 26 per cent. in quantity and 24 per cent. in value compared with 1935. Sales of hydrated lime, which are included in the above totals, amounted to 1,225,829 tons valued at $9,529,743, an increase of 22 per cent. in quantity and 20 per cent. in value. The average unit value of all lime in 1936 was $7.18 a ton compared with $7.28 a ton in 1935; hydrated lime showed a decrease from $7.90 a ton in 1935 to $7.77 a ton in 1936. The total number of plants that reported operations in 1936 was 301, the same as in 1935.

Sales of lime for agricultural uses—336,905 tons valued at $2,108,787 increased 19 per cent. in quantity and 11 per cent. in value; sales for construction—891,267 tons valued at $7,589,346, increased 36 per cent. in quantity and 33 per cent. in value; sales of dead-burned dolomite for furnace refractories—596,751 tons valued at $4,887,243, advanced 31 per cent. Ohio, the largest producer of this product, had an output of 314,924 tons valued at $2,746,898 in 1936. Other producing states are Alabama, Illinois, Pennsylvania, and West Virginia. Bureau of Mines figures do not cover the entire consumption of dead-burned dolomite for the reason that some of the large steel companies burn their own dolomite which is reported in the statistics on stone as shipments of raw dolomite.

A 26-per cent. increase in shipments of metallurgical lime (572,574 tons valued at $3,491,701) is partly attributable also to greater steel-making activity. Chemical lime, of which the paper industry is a large consumer, increased 21 per cent.

Fig. 1—Tractor-scraper unit preparing to dump a load of overburden alongside an old pit. On the next trip around, the angledozer at the front of the tractor will push this load into the pit. Ottawa Silica Co., Ottawa, Ill.

By **KENNETH F. PARK**
Chief Field Engineer
and **HOWARD L. STILLEY**
Asst. Field Engineer
R. G. Le Tourneau, Inc.

OPERATING WITH TRACTOR-SCRAPER UNITS

THE tractor-scraper method of earth moving is particularly well adapted to pit and quarry operations. In general practice the tractor-scraper's work may be broken into three classifications: (1) overburden removal, (2) material handling, (3) supplementary duties, such as building new roads, digging drainage ditches, building dams and reservoirs, etc.

Removing Overburden.—Because it is a self-loading hauling unit, the tractor-scraper combination has the very definite advantage of being able to move the spoil or waste material, as it is excavated, back from the pit edge, thus eliminating dangerous slides. The ability of the tractor-scraper unit to haul its own load often makes possible a more advantageous disposal of the spoil than is economically possible with the ordinary side-casting method of overburden removal. For example, many operators open new pits with tractor-scraper units arranged to haul so the spoil can be wasted into old abandoned pits, thus definitely eliminating later re-handling of the overburden.

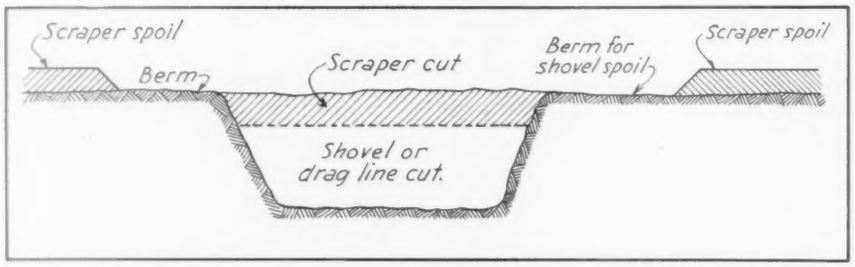


Fig. 2—Method often used when making box cuts with scrapers working as auxiliary units to shovels or drag-lines.

Fig. 3—Four units delivering gravel to the plant at Conchas Dam.

The Ottawa Silica Co., Ottawa, Ill., disposes of its overburden in this manner. It uses an angledozer in combination with the scraper (Fig. 1). The angledozer is controlled by a front-end power-control unit, so its operation does not interfere with the scraper. The scraper's load is dumped alongside the pit edge, then on the next trip around the angledozer pushes the previously dumped load into the pit. By using the scraper and angledozer in combination the extra tractor, normally needed for the angledozer, is eliminated.

The Bridgetown Sand & Gravel Co., Berlin, N. J., also using old pits for its overburden disposal, finds it both advantageous and economical to have an extra tractor on which a bulldozer is mounted. In this company's operations the scraper wastes the stripped material along the pit bank, then as soon as the sand is removed the tractor-bulldozer pushes the waste into the worked-out pit. When not busy on this work, the bulldozer is used for clearing brush, trees and rocks ahead of the scraper.

Where the overburden is comparatively shallow, that is, from 5 to 15 ft. deep, tractor-scraper units usually handle all the stripping, thus enabling the shovels and drag-lines to put all their time on the productive job of material handling. In deeper operations some pit operators use scrapers for removing the first few feet of overburden, finishing the job with shovels or drag-lines. In such cases, the scrapers normally remove their

portion of the overburden in such a manner as to form a berm (Fig. 2), so the shovel or drag-line can handle the remainder of the overburden in one cast, and cast back far enough to prevent slides.

Handling Material.—After the overburden has been removed from the pit the tractor-scraper combination can be converted from an earth-moving tool into a material-handling unit. When used for material handling from the pit, tractor-scraper units normally dump over a ramp on a conveyor leading directly into the plant, or, where the plant is some distance from the pit, into trucks. The usual big-capacity scraper hauls enough material in one load to fill one to four trucks. Once the material has gone through the plant, tractor-scrapers frequently can be used for stock-piling, and for reclaiming and loading from stock-piles.

Ben Griffith, contractor for the gravel on Conchas Dam in New Mexico, has four 12-cu. yd. scrapers delivering gravel from the pit to a belt-conveyor leading directly to the separator (Fig. 3).

The American Zinc Co. uses a smaller tractor-scraper outfit for handling pulverized lime. This material, which loads like sand, is picked up at the stock-pile by the scraper and transported 500 ft. to be dumped through a trap on a belt-conveyor which carries it to the cars or driers (Fig. 4).

The Mission Indian Agency near Indio, Cal., loads gravel into trucks from its tractor-scraper outfit (Fig. 5). The scraper picks up a load of gravel from the stock-pile, climbs a short ramp, and dumps through a trap into trucks. Each scraper-load makes two truck-loads.

Supplementary Uses.—One of the big advantages of the tractor-scraper combination is its ability to handle so many incidental jobs, such as building ramps into pits, building truck roads from pit to plant, digging drainage ditches, grading for railroad tracks, etc. Furthermore, when the scraper is not working, it can be quickly disconnected, thus leaving the tractor free for other drawbar or power-plant work.

The McGrath Sand & Gravel Co. first used a tractor-scraper outfit for removing overburden at its Pekin, Ill., pit. Then the rig was moved to Oak Hill and there excavated and graded for a spur track into a new plant (Fig. 6). After completing the grading it went back to stripping.

Output.—In estimating production three conditions must be taken into consideration: (1) the length of the haul, (2) the type of material, (3) the grades to be encountered. The length of the haul naturally has a direct bearing on the number of loads which can be handled and, therefore, on the ultimate output. The approximate output one should obtain from a 12-cu. yd. scraper on hauls from 200 to 2,000 ft. is given in Fig. 7. This chart deals only with the use of single tractor-scraper units.

For hauls of 2,000 ft., where conditions are favorable, the tandem scraper method is frequently used. This method of operation raises the output in some instances as high as 80 per cent. per tractor.

If adverse grades are encountered, and most pit operations will include

Fig. 4—Scraper and Diesel tractor hauling pulverized lime from the stock-pile to a conveyor belt. American Zinc Co., Mascot, Tenn.

Fig. 5—Tractor-scraper unit loading gravel into trucks by means of a ramp. Mission Indian Agency, Indio, Cal.

Fig. 6—Tractor-scraper unit grading for a railroad spur. McGrath Sand & Gravel Co.

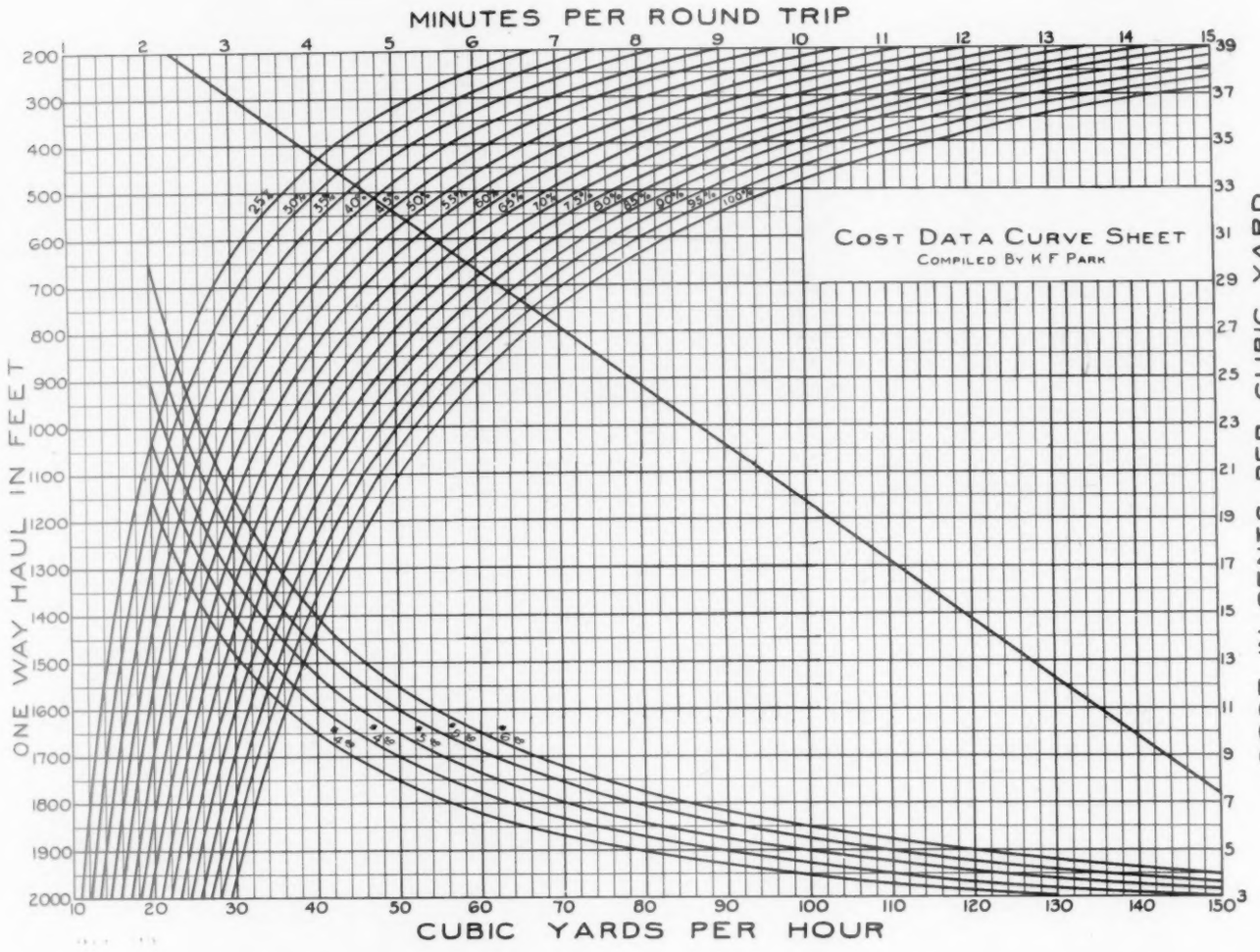

MINUTES PER ROUND TRIP
ONE WAY HAUL IN FEET
COST IN CENTS PER CUBIC YARD
CUBIC YARDS PER HOUR
COST DATA CURVE SHEET
COMPILED BY K F PARK

Fig. 7—DIRECTIONS FOR USE.—The 100-per cent. curve represents maximum delivery over a wide variety of grades and material. A probable job average should show on the 80- to 85-per cent. curve line. Excessive grades or exceedingly difficult material reduce operating efficiencies and should be taken into consideration when using this chart. To use this curve sheet, take the one-way haul distance at the left border and follow horizontal line to the outside, or 100-per cent. curve. Where the two meet, drop to bottom, reading output in cu. yd. per hr. If cost per yd. is desired, drop only to lower curve covering your estimated total equipment cost. Where the two meet, continue to right border, reading cost in cents per cu. yd. If time is desired covering round-trip haul, start with haul distance, continue along this line to the diagonal line, where the two meet, rise to top border reading minutes for total haul. Adverse conditions reduce efficiency ratings and should be judged.

some grades, the hauling time will be slowed down, with a resultant decrease in production. Consequently, grades should be taken into consideration when reading Fig. 7 for probable yardage. Grade limitations and the tractor gear necessary for hauling a 12-cu. yd. scraper over those grades are shown in Table I. This table presupposes fair footing for the tractor. Where underfoot conditions are soft, extremely sandy, or muddy, it will be necessary to use a gear or two lower than indicated in this table.

Cost Analysis—In order to arrive at a cubic-yard cost for excavation it is necessary to determine the hourly ownership and operating cost of the excavation unit, which is then charged against the hourly cubic-yardage production of the unit. Spreading depreciation over an 8,000-hr. period, the hourly cost of ownership and operation of the tractor-scraper unit varies from $4.00 to $6.00. This cost includes operator, repair funds, oil and grease, fuel consumption, interest, taxes, and insurance. From Fig. 7 it is also possible to arrive at a cost per cubic yard of hauls from 200 to 2,000 ft.

Table I.—Grade Limitations (small figures) and Gear

12-Cu. Yd. Scraper, loaded Gross load 42,000 lb. 8 cu. yd. @ 3,000 lb.	Grade Limit	5%	8%	11%	15%	18%	28%
	For Gear	6	5	4	3	2	1
12-Cu. Yd. Scraper, empty Gross load 17,300 lb.	Grade Limit	11%	16%	20%	25%	30%	44%
	For Gear	6	5	4	3	2	1
12-Cu. Yd. In tandem, loaded Gross load 84,000 lb. 16 cu. yd. @ 3,000 lb.	Grade Limit	1%	4%	6%	9%	12%	19%
	For Gear	6	5	4	3	2	1
12-Cu. Yd. Scrapers In tandem, empty Gross load 34,600 lb.	Grade Limit	6%	10%	14%	17%	21%	32%
	For Gear	6	5	4	3	2	1

Awards Contracts for Cement-Mill Equipment

★The Universal-Atlas Cement Co. recently awarded a $250,000 contract to the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., for cement machinery to be installed in its Leeds, Ala. plant, which is being rebuilt and reconditioned.

The contract covered four wet-process raw-grinding ball-mills, two air-quenching clinker coolers, two clinker-grinding preliminators and two clinker-grinding ball-peb mills.

Cadets gathered before new experiment station at College Park, Md.

Bureau of Mines Dedicates New Eastern Experiment Station

THE new Eastern Experiment Station of the United States Bureau of Mines was dedicated October 15 in the presence of dignitaries representing the State of Maryland, the University of Maryland, and the Bureau of Mines. The station is housed in a new colonial building located on the campus of the University at College Park, Md., only a few miles from downtown Washington. It consists of a three-story main building approximately 53 ft. by 114 ft. flanked by two-story wings 50 ft. by 113 ft. each. The entire structure also has a complete basement and attic. It is in keeping with the other buildings at the University of Maryland, which donated the 20-acre site on which it stands. The building was designed by Henry Powell Hopkins, architect, and was constructed under the supervision of the Procurement Division of the Treasury Department.

The dedication ceremony included addresses by Dr. John W. Finch, director, U. S. Bureau of Mines, Dr. H. C. Byrd, president, University of Maryland, and Honorable Harry W. Nice, governor of Maryland. Virtually all the work of the new station directly concerns the nonmetallic-mineral industries. The Metallurgical Division will conduct work in mineral physics and similar research at the station. Among the interesting projects now under way is the use of chemical snowstorms and sound waves for dust precipitation. Experimentally both give promise of developing into commercial procedures giving results comparable to the Cottrell precipitator now in common use.

Nonmetals Problems.—Research on nonmetals formerly conducted in New Brunswick, N. J., has been transferred to the College Park station. Oliver C. Ralston, who is in charge of this work, outlined the trend toward utilization of low-grade easily-accessible nonmetallic-mineral deposits and away from selective mining of high-grade deposits. Among the developments aiding this trend have been the successful commercial flotation of phosphate rock, cement raw materials, and potash. This work, of course, has led to investigations in connection with other minerals and at least 30 nonmetallic minerals have been floated in laboratory experiments. Talc is now being treated commercially and it is expected this winter that a commercial operation will separate quartz and feldspar by flotation. The full possibilities of agglomeration in mineral-separation processes have not yet been determined.

Chemical methods of nonmetals beneficiation need further research. A project to study chemical methods for removing iron stain from glass sand, clay, and possibly other minerals is to be undertaken. New uses for all nonmetals will be investigated at the station. Mr. Ralston particularly asked the coöperation of the nonmetals industries in suggesting projects to be undertaken by his staff.

A summary of the research done by the Nonmetals Division during the fiscal year ending July 1, 1937, has also been prepared by Mr. Ralston.[1] Several of these investigations are of particular interest.

Hydration of Lime.—The effects of conditions of hydration and prior burning on the properties of lime hydrate were studied. Both high-calcium and dolomitic limes were carefully burned and then hydrated in a special apparatus designed for close control of the quantity of water added and the temperature of hydration (by water cooling). The various hydrates were tested for settling rates, putty volumes, and plasticity index (Emley plasticimeter). The most important variables discovered were the temperature of hydration and the degree of hydration of the magnesia in the hyradated product. The better the hydration of the magnesia, the higher the plasticity index. Dolomites that at present do not yield finishing limes could be made to do so by controlling conditions during hydration.

Gypsum and Anhydrite in Cement.—A study of the relative value of gypsum and anhydrite in cement has been concluded. It was found in this study that cement exists in different states of activity, depending on the amount of adsorbed water vapor. Curiously, while a small amount of water vapor depresses the setting of cement, an excess reactivates the cement. In the study freshly-ground cements were artificially conditioned by causing them to adsorb as much water vapor as they would adsorb inadvertently in practice. It was found that anhydrite is intrinsically less effective than gypsum as a retarder of setting. The amounts that may be used safely depend on the conditioning of the cement. As much as 75 per cent. of anhydrite associated with gypsum may be effective, but in practice the amount that may be used safely is less. The compressive and tensile strength appear to be lowered slightly by the presence of anhydrite.

Pozzuolanic Minerals. — Cement mortars can, under correct conditions,

[1] Ralson, O. C., *Annual Report of the Nonmetals Division, Fiscal Year 1937*, U. S. Bureau of Mines I. C. 6974, October 1937. Available without charge from Publications Section, U. S. Bureau of Mines, Interior Building, Washington, D. C.

be made more plastic, more impermeable, noncorrosive, and even stronger by including pozzuolanic admixtures. With this in mind a study has been undertaken of natural, artificial, and artificially-enhanced pozzuolanic minerals. Their true action is still obscure, and both scientific and technologic studies are needed. A better measure of workability or plasticity of mortars is needed, and a tentative one has already been devised and will be reported on later as the first step in the study of pozzuolanic minerals.

Seismometer Tests.—J. R. Thoenen will direct the activities of the Nonmetals Section of the Mining Division with headquarters at College Park. The most interesting work now under way in this section is the measurement of house vibrations resulting from quarry blasts or other disturbances. Intensive work has been done in a house located in the District of Columbia and the results of actual seismometer tests indicate that the effects of door slams, heavy traffic, and similar disturbances may be of about the same magnitude as that of quarry blasting 1,000 or 2,000 ft. away. Investigations, however, have not yet been carried far enough to develop a definite destruction index.

A.I.M.E. Meeting.—The annual fall meeting of the Industrial Minerals Division of A.I.M.E. was held in Washington and College Park as an added feature of the dedication ceremony. Headquarters and the first day's sessions were at the Wardman Park Hotel, but the following day all the activities were transferred to College Park.

Drilling and Blasting.—Experiments in drilling and blasting practice at the Rock Chapel plant of Consolidated Quarries Corp. near Lithonia, De Kalb County, Ga., were ably described by Nelson Severinghaus, superintendent of the operation. The rock quarried is granite-gneiss, which has an easy split and tends to break down in large blocks. An unconventional spacing of drill holes was found to give the best breakage of this particular rock. Thirty-two-ft. spacing and 16-ft. burden were used to obtain the best results with a quarry face of 90 to 110 ft. In blasting the new safety explosive, Nitramon, was used. Instantaneous detonations of all holes, and several separated points of detonation within each hole gave the best fragmentation of the various blasting methods tried in the quarry.

Jackbits.—Results of drilling tests in feldspar at the Hubert O. De Beck mine at Green Mountain, N. C., were described. Six-point jackbits obtained 20 per cent. more footage and had a 25 per cent. faster drilling speed than the 4-point jackbits. Also, drilling with 4-point bits cost 6.3c. more per ft. (3.3c. difference in bit cost per ft. + 3.0c. difference in cost per ft. drilled) than with 6-point bits. Parallel results were obtained with 4-point and 6-point bits made in the mine blacksmith shop on standard drill steels.

Mining Methods. — The mining methods of the Peerless White Lime Co. in southeastern Missouri were described by Ralph W. Smith. The mine operates on the upper 80 ft. of the Spurgen formation, which runs 98.5 to 99.0 per cent. $CaCO_3$. The room-and-pillar method is used, taking an upper bench of 50 ft. before removing the 30-ft. lower bench. Slow-speed dynamite is used to prevent excessive breakage as minus 4-in. rock is discarded. Gelatine is used only in wet holes. An interesting safety precaution when blasting in a particular heading consists of two warnings: an air whistle, and the ignition of red flare powder at the entrance to the heading. The powder burns for 30 sec., identifying the heading in which the blasting is being done. A suspended platform has been used to handle bad roof conditions along one of the main haulageways.

Mineral Separation.—G. W. Jarman of the Separations Engineering Corp. outlined the histories of the magnetic, air, and electrostatic methods of mineral separation and told of the latest developments in each type. Interesting cost figures presented by Mr. Jarman follow:

Magnetic Separation. — Installation cost of $1,000 to $3,000 per ton-hr. and operating cost of 12 to 40c. per ton with 60c. labor and a 10-yr. depreciation.

Air Tables. — Installation cost of $350 to $1,000 per ton-hr. and operating cost of 10 to 30c. per ton with a 5-yr. depreciation.

Electrostatic Separation. — Installation cost of $3,000 to $4,000 per ton-hr. and operating costs of $1 to $2 per ton.

Sand and Gravel.—E. L. Spain of the T.V.A. geological division presented a geological study and tests of the gravels found throughout the course of Tennessee River. Freezing and-thawing and sodium-sulphate tests performed on whole-gravel samples as well as various constituents of the samples proved that quartzite and sound chert are the most desirable components. It was generally agreed in the discussion that accelerated tests on sand and gravel have value but that the interpretation of the results when compared with actual experience in concrete presents a confusing and sometimes conflicting situation.

Stanton Walker of the National Sand & Gravel Assn. gave the general plant set-up and distribution of the sand-and-gravel industry. He pointed out the necessity for careful processing because modern specifications stress soundness and durability, hardness and strength, the amount of deleterious impurities, as well as sizing and grading. Possible separations of sand and gravel by agglomerate tabling methods and proposed tests for the specifications were discussed.

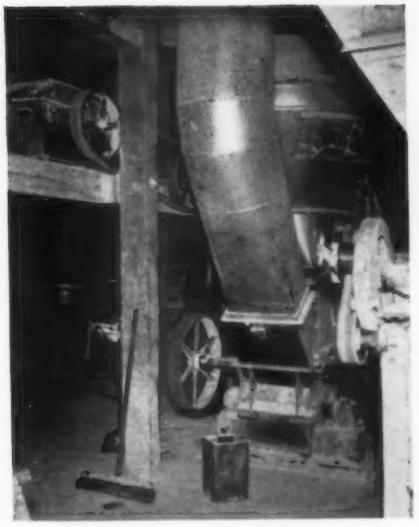
Mineral Wool.—J. R. Thoenen of the Bureau of Mines outlined the results of a survey of mineral-wool plants in 1936. Compared with the last previous survey in 1928 the mineral-wool industry has increased from 8 to 50 plants and from 50,000 tons to 500,000 tons capacity. Probable specifications governing mineral-wool sales will no doubt include reference to lime and sulphur content, amount

(*Continued on page 58*)

President H. C. Byrd, Dr. John W. Finch, and Governor Harry W. Nice arrive for the dedication ceremonies in connection with the new experiment station.

By W. E. TRAUFFER

Diesels Provide Cheap Power at Lime Plant in Montana Hills



New beater mill with attached separator above. Variable-speed reducer at left.

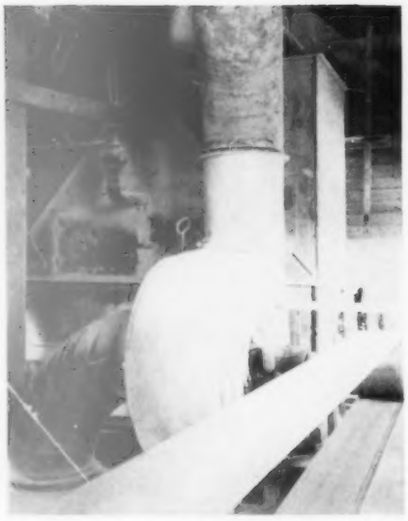
THERE are in the lime industry many operators of both large and small plants who believe, if one may judge from their plants, that they can operate indefinitely and profitably with obsolete and worn-out equipment. The lime industry, along with other nonmetallic-minerals industries each year faces stricter specifications and keener competition. Progressive producers have found that they can prosper under these conditions only by keeping their plants at peak efficiency. This is particularly true of small plants in which the labor cost per unit of product is necessarily high.

Such a plant is operated by the Elliston Lime Co. at Elliston, 22 mi. west of Helena, Mont., on the main line of the Northern Pacific Rwy. While this is only a small operation, it is complete in every detail, producing quicklime, both pebble and pulverized, and hydrated lime. This plant can produce 36 tons of quicklime in 24 hr. and can hydrate and pack 30 tons in the same period. When not hydrating, the plant can produce 30 tons of pulverized quicklime in 8 hr. Shipments are made to the entire state of Montana and to part of Idaho.

A brief history of this operation illustrates the progressiveness of this company in adopting modern methods as they become available. The deposit was first opened to supply pot kilns about 50 years ago. In 1902 W. T. Kuehn, president of the company, built two of the existing kilns and the bulk-loading bin. All shipments were made bulk until 1908, when facilities were installed for making steel barrels. In 1925 a small beater mill and the hydrator with their accompanying equipment were added. Because of the prohibitive cost of running an electric-power line to the plant at that time, a 100-hp. Diesel engine was installed to operate this equipment. Early in 1937 the beater mill was replaced with a larger mill and the screen was installed. A 40-hp. Diesel engine was added to carry the extra load.

The deposit is unusual only in that it is located far up on the hillside above the plant. The usual drilling, blasting and hand-loading procedure is followed. The contents of the quarry cars are discharged into a 250-ton bin. Stone is drawn from this bin over a grizzly into the skip cars. A single-track balanced tramway, 900 ft. long with a 22-per cent. grade, is used to lower the rock to the kiln-charging floor. A passing switch

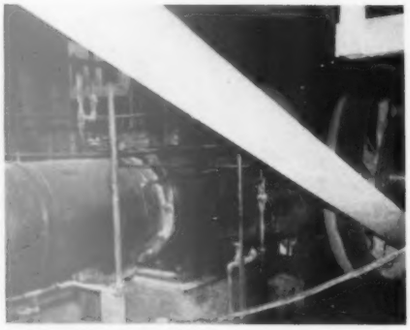
Plant of the Elliston Lime Co. on a Montana hillside near Helena. Quarry and tramway are at the right.



The blower for the pulverizer with the one-ton batch hydrator in the rear.

midway in the incline has spring frogs which automatically allow the two cars to pass. The weight of the stone in the loaded car operates this system, which is controlled by a brake at the head pulley.

The stone is discharged from these cars into the three vertical kilns.



Much of the equipment is driven by this 100-hp. semi-Diesel engine.

These are 13 ft. in outside diameter and 28 ft. high above the firing floor. Each kiln has a 12-ft. cooling zone. The kilns are hand-fired with No. 2 nut coal. A ratio of about 3 to 1 is obtained on year-around operation,

Vibrating screen used in the production of pebble lime.

including all the startings and stoppings. The lime is drawn through shear gates and spread out on the cooling and storage floor. The picked lime is then shoveled by hand into bins for either bulk loading of cars or for barrel loading.

The lump lime can also be shoveled into a Sturtevant rotary crusher which discharges it into a Webster chain-bucket elevator on 35-ft. centers. From this elevator the lime can be sent in several ways. When pulverized quicklime is being made, the lime is discharged into a screw-conveyor serving a bin, which feeds the Raymond No. 1 beater mill fitted with a Whizzer integral sperator. This mill is equipped with special swing-hammers designed for pulverizing both quick and hydrated lime. A Raymond No. 11 exhaust fan draws the product from this mill into a cyclone from which it drops into a 5-ton bin over a Bates 2-tube packer.

The storage shed has space at the car-loading level for 100 tons of bagged lime. Valve Bag Co. paper bags are used.

When hydrating, the lime is discharged from this elevator into the weigh-hopper of the Weber 1-ton batch hydrator. It is dropped into a 3-ton hopper from which a Webster screw-conveyor feeds the beater mill. The same fan, cyclone, bin and packer are used. When changing over from one pulverized product to the other, it is only necessary to clean out the packer bin.

When producing pebble lime, the crusher product is discharged from the same pulverizer-feed screw on a fully-inclosed 2-ft. by 6-ft. Allis-Chalmers vibrating screen. This has ¾-in. and ¼-in. cloth on the top and bottom decks, respectively. The fine material passing through this screen is carried by a screw-conveyor back into the hydrator-feed flow. The ¼-in. to ¾-in. pebble lime is discharged into a bin, from which it is packed into open-mouth paper bags or barrels or taken for shipment in bulk.

A 100-hp. Primm semi-Diesel engine and a 40-hp. McCormick-Deering Diesel engine drive separate lineshafts from which all the plant equipment units are driven through individual flat belts. The beater mill is also driven through a Link-Belt P. I. V. variable-speed reducer. According to H. T. Kuehn, vice-president of the company, the plant is operated the year around when business justifies. Even with temperatures of 35 to 40 deg. below zero no trouble has been encountered in starting and operating these engines.

Concentrating Feldspar Ores by Flotation

The feldspar minerals are used in the glass and ceramic industry for alkali or alumina content or both. The requirements as to the proportion of alkalis are quite flexible, but the trade demands certain constant ratios of alumina to silica. Careful mining, blending, and hand-picking are used to maintain certain grades. To minimize the loss in the fines not amenable to hand-picking and to treat lower-grade ores that require grinding for liberation, various methods of beneficiation have been considered. The feldspar producers are not the only ones interested in a suitable means of purification, as some of the granite producers realize that they have a loss in the fines that may be turned into a profit.

The physical properties of the feldspar and quartz are so nearly the same that some other method besides gravity concentration must be used. Furthermore, size requirements have a bearing on the adaptability of the process.

Last year some work on the beneficiation of feldspar products was done at the Southern Experiment Station in connection with the study of the floatation of clay. Two methods of concentration were used — froth flotation for fine material and agglomerate tabling for minus 20-mesh material. Numerous products containing various kinds of feldspar were tested. Both methods are adaptable to the concentration of feldspar. By controlling the reagents either the feldspar or quartz can be separated from the other.

Further work is in progress along these lines. Encouraging results have been obtained. In the coming year it is expected to bring about a commercial separation of quartz and feldspar. —*1937 Annual Report, Nonmeta's Division, U. S. Bureau of Mines.*

A.I.M.E. (from page 56)

of shot present, fiber size, and ductility. In discussing the health hazard in breathing wool fibers in dusty plants Mr. Thoenen stated that it probably is not pathological but rather a mechanical hazard resulting from irritation by the fibers.

Mr. Thoenen has been nominated to succeed Chester A. Fulton as chairman of the Industrial Minerals Division of A.I.M.E.

FERRARI'S "UNIVERSAL CEMENTS"

A technical discussion for cement chemists and the cement industry in general by that noted German authority—

PROF. DR. HANS KÜHL

Berlin-Lichterfelde

IN an article on "Universal cements," which F. Ferrari published about a year ago in *Tonindustrie-Zeitung*[1], it is stated that cements with equivalent amounts of alumina and iron oxide unite in themselves a great number of valuable properties; properties, in fact, which otherwise are ordinarily encountered only in isolated fashion in one or another of the other special cements.

This accumulation of favorable properties Ferrari ascribes to the fact that cements with equivalent amounts of alumina and iron oxide contain neither tricalcium aluminate nor dicalcium ferrite; all harmful quantities of these components have disappeared, because alumina and iron oxide are combined into tetracalcium aluminate ferrite and, as a consequence of this, such cements are distinguished by high strength, low heat development, low shrinkage and high resistance to chemical attacks.

Ferrari's statements deserve without doubt the most careful attention, for they signify, not only for the user of cement but plainly also from the standpoint of the manufacturer, a great forward step if it becomes possible to combine in a single variety of cement the greatest possible number of the properties required in the construction industry.

Although in earlier decades the construction industry was inclined to take the ordinary cement rather for granted, we find more and more in recent times the demand that for special purposes of use special cements should be provided. This demand has been well expressed with special emphasis by P. H. Bates[2], for Bates required even in the year 1933 the production of seven different types of cement. A similar development had led even before that in Sweden[3] to the creation of several different types of cement, and I myself[4] have been spokesman for the idea that for German conditions four different sorts of cement should be produced, *viz.*, a cement with preëminently high initial strength, a cement with the lowest possible tendency to shrinkage, a cement with low heat of setting, and a cement with high resistance to chemical attacks. It is certainly not without interest that it is exactly these four properties which, according to Ferrari's article, are united in the "Universal cement" which he advocates.

Among cement producers these requirements have not found universal and not always the correct understanding. At times the development took the direction that more and more new special products were brought out, but only on the basis of the advertising of the plants, and the properties claimed for these products did not always agree with reality. On the other hand, in many countries a pronounced aversion on the part of cement manufacturers to the production of special cements was encountered.

This aversion is thoroughly understandable if one is acquainted with the nature and operation of a cement plant. An industry, which is so greatly based on mass production as the cement industry always has difficulties if it has to convert its installation from the production of one product to the production of another product. Another obstacle lies in the silo problem. A cement factory which does not have very large cement warehouses has difficulties enough in meeting the variations of seasons and the fluctuations of prosperity; these difficulties are naturally increased if, instead of one product, it is necessary to produce and to warehouse two, three or still more different kinds of cement.

The "Universal cement" which Ferrari advocates for the elimination of all these difficulties was discovered and protected by patent[5] by Ferrari himself almost twenty years ago. The fact that, in spite of the long time that has elapsed since that time, the cement has still not been adopted may perhaps be explained by the fact that the development of the new cement proceeded on scientific assumptions which later have been proved to be unacceptable. Only later research has shown that the special production of cements with equivalent amounts of alumina and iron oxide is to be ascribed to the formation of tetracalcium aluminate ferrite, that remarkable compound which was discovered in the year 1928 by W. C. Hansen, L. T. Brownmiller and R. H. Bogue[6]. Since tetracalcium aluminate ferrite possesses an especially high stability, it is

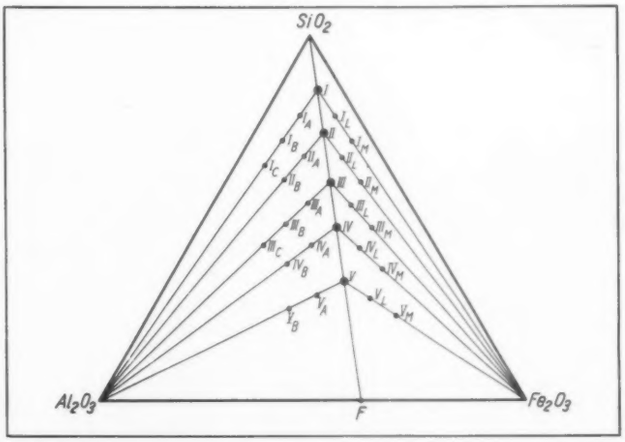


Fig. 1. Position of the experimental cements in the SiO—AlO—FeO diagram.

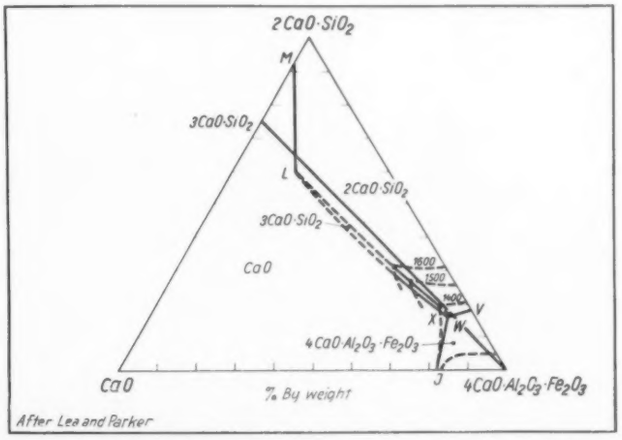


Fig. 2. The ternary diagram CaO—2CaO. SiO—4CaO. AlO. FeO.

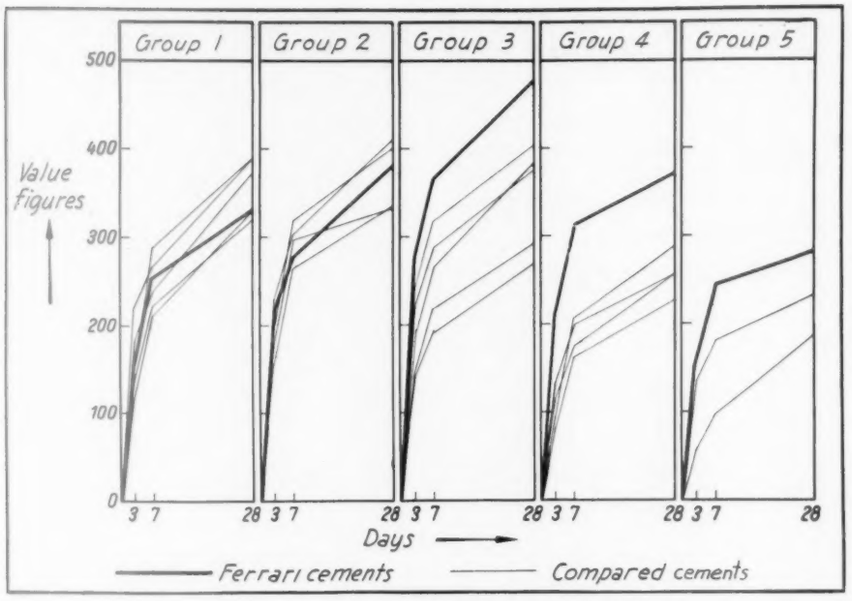


Fig. 3. Strength curves of all the cements tested.

formed whenever the conditions for its formation are present.

While Ferrari came upon the cements he discovered while seeking cements with specially high resistance against chemical attacks, I came upon similar cements in a quite different way. I had found in my investigations of the significance of iron oxide for the technical properties of Portland cement, that cements with specially high initial strength are produced when the silica content of the cements is decreased and the content of iron oxide, in its stead, is increased far above the ordinary[7]. Such cements have been manufactured since the year 1923 in a number of countries and introduced into commerce under the designation "Kühl cement". The fact that the production, in view of the outstanding strength properties of the cement, has not achieved greater extent is, I believe, to be ascribed principally to the fact that certain diculties of burning are encountered in its manufacture. With the increasing of the iron-oxide content the sintering temperature falls lower and lower, which in itself is an advantage; at the same time, however, on account of the increase of the melt phase a greater and greater softening of the sintering mass occurs, and this softening, unless the operation is conducted with great care, is attended by the caking of the sides in the shaft kiln and by the formation of rings in the rotary kiln. Even if these difficulties can be combatted by very careful firing, still it has not yet been possible to master them completely, so long as one adheres to the values I have particularly recommended for silica, alumina and iron oxide. Only very recently have the researches of F. M. Lea and T. W. Parker[8] on the quaternary system lime-silica-alumina-iron oxide provided, among other things, the explanation of this fact, in that they show that increasing the iron oxide in the raw mix causes, first slowly and then faster, an accelerating increase of the melt phase.

The thought that it might be possible to create cements with especially valuable properties if Ferrari's proposal as to the equivalence of the sesqui-oxides is combined with my proposal as to the diminution of the silica content, led me to ask Dipl. Ing. Dr. Hans Albert, the technical director of the Kronstädter Portlandzementfabrik Kugler & Cie. at Kronstadt (Rumania), to study this question and to investigate the properties of cements in which, according to Ferrari's ideas, alumina and iron oxide are present in equivalent amounts and in which, according to my ideas, the silica content is greatly lowered in favor of alumina and iron oxide. This problem resulted in producing Ferrari cements of different silica contents and comparing them, with regard to the possibilities of manufacturing them under plant conditions and to their technical properties, with other cements, in particular with Kühl cement.

Dr. Albert first oriented himself as to the range that need be considered, by means of a series of laboratory investigations, and then burned Ferrari cements of different silica contents on a large scale in the rotary kiln, and tested the cements produced from these clinkers for their technical properties.

As a basis for the approach to the laboratory tests a working scheme which is represented in Fig. 1 was employed. Within a triangle, at the corners of which the determining points for silica, alumina and iron oxide are entered, the Ferrari cements lie along a straight line which connects the silica corner with the point F, which last divides the line joining Al_2O_3—Fe_2O_3 in the ratio of the molecular weights of alumina and iron oxide.

Dr. Albert produced five experimental cements in the laboratory, of which the content in silica, alumina and iron oxide is represented by the points designated as I to V in the triangular representation. If we compute for the five cements so defined their contents in tricalcium silicate and tetracalcium aluminate ferrite, we come to the following composition:

Cement	Tricalcium Silicate	Tetracalcium Aluminate Ferrite	Silicate Modulus
I	92.5%	7.5%	6.03
II	85.0%	15.0%	2.77
III	75.0%	25.0%	1.47
IV	65.0%	35.0%	0.91
V	50.0%	50.0%	0.49

In addition to these five Ferrari cements a great number of cements with higher content, in some cases of alumina and in some cases of iron oxide, were produced for purposes of comparison; the points entered in the triangular diagram to the left and right of the Ferrari cements correspond to them.

In order to be able to identify as definitely as possible the effect of the hydraulic factors on the properties of the cement it was necessary to give all the cements the "same" lime content. For this purpose there were necessary first some theoretical considerations proceeding from the quaternary diagram CaO—SiO_2—Al_2O_2—Fe_2O_3.

In cements which contain alumina and iron oxide in equivalent amounts there can occur, of the components otherwise occurring in Portland-cement clinker, only the compounds tricalcium silicate (C_3S), dicalcium silicate (C_2S) and tetracalcium aluminate ferrite (C_4AF) along with free lime and vitreous residual melts. Consequently all "Ferrari cements" must fall inside the triangle at the corners of which the compounds CaO, C_2S and C_4AF are placed. This triangle, according to the diagram of Lea and Parker, is represented in Fig. 2.

The figure shows that, as in the case of ordinary Portland cement, so also in the case of the Ferrari cements, a primary separation of C_3S out of the lime-saturated cement melts is im-

possible, for the region of the primary separation of C_3S lies outside the conjugation line between C_3S and C_4AF; instead, the latter falls for its greater part within the region of primary separation of C_2S. As a consequence of this, it is impossible even in the case of the Ferrari cements to attain a complete lime saturation according to the formula of R. H. Bogue, for in the rapid cooling of the sintering mass equilibrium can not set in.

However, while in the case of ordinary Portland cement an enriching of the *solid* phase in lime occurs, we find that in the case of Ferrari cement, even from lime-saturated raw mixtures, C_2S is primarily formed, and that, therefore, in cements of this sort the *fluid* phase must be enriched in lime. This has the consequence that in the final hardening either a glass extra rich in lime occurs, or that free lime crystallizes out of the residual melts. If it is desired with Ferrari cements to achieve complete combination of the lime introduced into the raw mix, it is therefore necessary, as in the case of the Portland cements, to introduce less lime into the mixture that corresponds to complete saturation.

This fact, of course, is not of all-too-great significance in the production of Ferrari cements, and particularly in the production of low-silica Ferrari cements, for the field of the primary separation of C_3S lies—especially in its colder part—so close to the conjugation line C_3S—C_4AF that the variation of the attainable lime saturation from the theoretical lime saturation is almost imperceptible.

I have already dealt exhaustively with these questions once before in this magazine, and refer to my article *Developing Formulae for Determining the Correct Lime Content of Cement*[9]. There it is shown that the amount of lime which can be combined by Portland cements with the most varied ratios of the hydraulic factors, can uniformly be represented by the following formula:

$$CaO = 2.8\ SiO_2 + 1.1\ Al_2O_3 + 0.7\ F_2O_3.$$

I then designated this amount of lime as the *standard lime* of a cement and from this derived for the practically producible cements the concept of the *lime standard*, which I defined "as the percentage of its actual lime content in proportion to its standard lime," according to the formula:

$$L.St. = 100. \frac{\text{Actual Lime}}{\text{Standard Lime}}$$

$$\frac{100\ CaO}{2.8\ SiO_2 + 1.1\ Al_2O_3 + 0.7\ Fe_2O_3}$$

The standard formula which I then developed has been confirmed and as regards the coëfficients of alumina and iron oxide even a little improved by the investigations of Lea and Parker. According to Lea and Parker, the maximum amount of lime is to be expressed by the formula:

$$CaO = 2.8\ SiO_2 + 1.18\ Al_2O_3 + 0.65\ Fe_2O_3.$$

The difference is, as one sees, so slight that it can have no effect in practice.

In all the experimental cements which Dr. Albert produced the "sameness" of lime content was attained by proportioning all the raw mixtures with the lime standard 100. In order also to eliminate as much as possible the errors which might have arisen from the preparation of the raw materials, the conduct of the burning, the grinding of the cement or from other sources, the miniature testing method[10] developed by me was employed for the production and the testing of all the experimental cements.

The investigation of the cements produced in the laboratory was essentially confined to the testing of the strength properties. The results obtained in these tests are graphically represented in Fig. 3.

First there was determined, from all the strength figures that were found for one cement, a "value figure", which is indicative of its hardening capacity and which corresponds to the average of all the tensile- and compressive-strength figures found. These value figures were assembled for the cements of Groups I to V in such a manner that in each group the strength curve for the Ferrari cement stands out in bold, while strength curves for the adjacent cements are represented by the fine, lines.

As will be seen, the strength curves of the Ferrari cements in Groups I and II, that is, in the case of the cements high in silica, lie rather without any regularity between the strength curves of the cements similar to them and adjacent to them. The picture in Groups III, IV and V becomes something quite different; here the Ferrari cements show much better hardening capacity than the adjacent cements with higher contents of alumina and iron oxide.

Group III deserves particular attention in this connection, for here far the highest strength figures are attained, from which it therefore results that a Ferrari cement which consists of approximately 75 per cent. of tricalcium silicate and approximately 25 per cent. of tetracalcium aluminate ferrite not only has better strength properties than the Portland cements close to it, but that such a Ferrari cement also considerably excels the other Ferrari cements in its strength.

This result has not only practical but also scientific interest, for it shows that a very high content in tricalcium silicate alone does not by itself result in high strength figures; an adequate amount of a second material—tetracalcium aluminate ferrite—must be present in order to yield the favorable

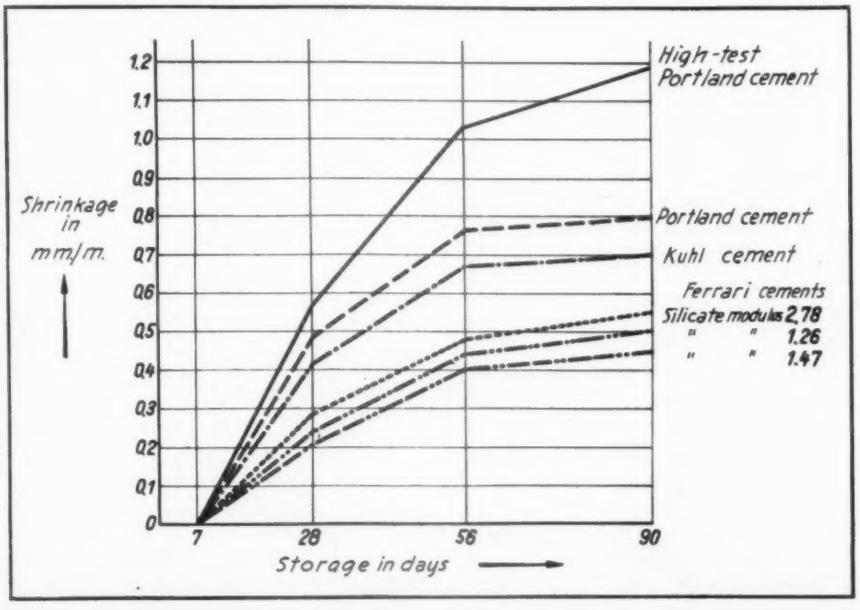


Fig. 4. Shrinkage behavior of the tested cements, unit storage.

conditions for the formation and the hardening of a high-test cement.

On the basis of these observations Dr. Albert produced in the operation of the Kronstädter Portlandzementfabrik, in several experimental periods, three different Ferrari cements: a high-silica Ferrari cement according to Ferrari's directions with the silicate modulus 2.78, and two low-silica Ferrari cements with the silicate moduli 1.47 and 1.26.

It was possible to produce the raw mixes for these different cements out of the ordinary raw materials of the Kronstadt Portland-cement plant by combining the available limestone with somewhat different kinds of clay according to the specific requirements. A third material had to be introduced into the raw mix for increasing the content of iron oxide; for this a pyrites cinder, which could be obtained from an adjacent sulphuric-acid factory, was used.

The raw mix for the experimental cements was ground to the fineness of 10 per cent. residue on the sieve with 4,900 mesh per sq. cm. customary at the Kronstadt plant, and after being formed into small lumps burned in a Lepol rotary kiln with oil firing.

Since, according to experiments in the burning of Kühl cement, the possibility of an all-too-great softening of the mass and, in connection therewith, sticking and ring formation had to be reckoned with, in the transition from the burning of the ordinary cement to the burning of Ferrari cement special precautionary measures were taken, the oil feed being cut down and the fire brought as far forward as possible. Cutting down the fuel feed was intended to take into account the easy sintering of the mass, and moving the fire forward was intended to afford the possibility of observing immediately any damages which might occur and of eliminating them by appropriate measures.

In practical operation it turned out that the high-silica Ferrari cement with the silicate modulus 2.78 was comparatively hard to sinter and in any case was less easy to burn thoroughly than the Portland-cement clinker of normal manufacture; on the other hand, in the burning of the low-silica Ferrari cements an appreciable decrease of the fuel requirement occurred; it was estimated by the management of the plant at about 10 per cent. of the normal oil requirement, which ought to correspond to a decrease of temperature of about 100 deg. C. Injuries through ring formation did not occur, from which it is to be concluded that—quite in accordance with the theory of Lea and Parker—in spite of the lowering of the burning temperature an excessively large formation of melt phase did not occur.

While the high-silica Ferrari-cement clinker was not especially dense, the low-silica Ferrari clinkers were exceedingly densely-burned; they had a considerably higher weight per liter than the usual clinker.

Since it was feared that the very dense and hard-burned clinker would be difficult to grind, comparative grinding tests were instituted with a laboratory mill, in which, in addition to the Ferrari clinkers, ordinary clinker and Kühl clinker produced for the purpose of comparison were subjected to the grinding process. It resulted that during the first period of grinding the grinding process proceeded more slowly in the case of the low-silica Ferrari cements than in the case of the compared cements, but that after reaching a certain fineness the low-silica Ferrari clinkers could be more easily ground than the compared clinkers, so that at the end, after the same period of grinding, the low-silica Ferrari cements were considerably finer than the compared cements. From this behavior it appears that the low-silica Ferrari cements, while hard, are brittle; because of their hardness they at first present considerable resistance to crushing, but because of their brittleness the fine grinding proceeds comparatively easily.

The cements ground to a residue of 10 per cent. on the sieve with 4,900 mesh per sq. cm. were tested for all important properties. As regards the setting time and soundness (constancy of volume) the cements proved entirly normal. The strength figures obtained both in the dry (*erdfeucht*, "earth-damp") and in the plastic tests corresponded to the expectations that had been fostered by the result of the laboratory experiments. The Ferrari cements of low silica distinguished themselves especially by very high tensile and compressive strengths. The burden of the investigation, however, lay in the testing of the cements for the special properties of shrinkage and of resistance to chemical attacks.

From earlier investigations of F. H. Gonnermann[11], of H. Woods, H. P. Starke and K. Steinour[12] and of H. Kühl and D. Lu[13] we already know that the shrinkage of cements depends very largely on their content in tricalcium aluminate, and consequently it was to be expected that the Ferrari cements would show particularly favorable shrinkage figures. The results which were obtained in the shrinkage tests may be judged from Fig 4; in that illustration, in addition to the shrinkage figures for the three Ferrari cements there are entered, for comparison, the shrinkage figures of a Kühl cement, an ordinary Portland cement, and a high-test Portland cement. The high shrinkage figures which the high-test Portland cement shows can be disregarded, for this cement had received an admixture of calcium chloride, by which, as we have long known, the shrinkage figures are driven upwards. Very interesting, however, is a comparison of the shrinkage figures of the three Ferrari cements with the shrinkage figures of Kühl cement and of Portland cement. It is to be seen that the increasing of the content of tetracalcium aluminate ferrite, even in the case of the Kühl cement, brings about reduced tendency to shrinkage, but that the tendency to shrinkage is still much more reduced if alumina and iron oxide stand in equivalence relation according to Ferrari's directions.

The cements were finally tested for their resistance to chemical attack, small test specimens of 3 cu.cm. content being exposed to the action of solutions of ammonium chloride, of sodium sulphate, of magnesium sulphate and of magnesium chloride and after determined times were subjected to strength tests. Here again ordinary Portland cement and Kühl cement were tested for the purpose of comparison. All the cements tested were attacked to about the same extent by the ammonium-chloride solution; evidently because the lime liberated in hardening and the lime separated hydrolytically are leached out by the ammonium chloride. In their resistance to the other solutions, however, there were very considerable differences in the results, in connection with which the Ferrari cements proved to be far superior to the other cements. While the magnesium-sulphate solution, known to be particularly harmful, at the end of 90 days had decreased the strength figured for the compared cements by 31 to 47 per cent., the Ferrari cement had suffered a loss of only 6 per cent.

In these results the statements of Ferrari concerning the strength, the shrinkage behavior and the resistance to chemical attack find their confirmation.

An investigation of the thermal reaction has not been undertaken; however, investigations by S. Solacolu[14] have shown that the Ferrari cements also have a low heat of set, which of course is scarcely surprising, for we know at any rate that the high heat

of set of many cements is to be ascribed principally to their content of tricalcium aluminate.

In conclusion it can be said that the theoretical and practical investigations which have been reported in the present article have in fact shown that in the Ferrari cements we have to do with cements which unite with one another in advantageous manner a large number of useful properties.*

* A comprehensive report by Dr. Albert on the production and the properties of Ferrari cements will shortly appear in book form, published by *Tonindustrie-Zeitung*, Berlin.

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Declares Gas Tax Too High in Southeast

Business in the southeastern states is suffering because of excessively high gasoline tax rates, Baird H. Markham, director of the American Petroleum Industries Committee, told delegates at a recent conference on automotive taxation held in Atlanta, Ga.

The highest gasoline tax rates in the United States are to be found in the region bounded by the Atlantic, the Gulf, the Mississippi, and the Mason-Dixon line, where federal and state levies range from 6c. to 8c. a gallon, Mr. Markham said. Vacation resorts, hotels, restaurants, stores, garages, filling stations, tire shops, tourist camps, and other businesses would gain by lowering the high gasoline tax barrier which is now frightening many desirable tourists and visitors away, he asserted.

"Travel bureaus and automobile clubs report a growing consciousness of taxes on the part of tourists," he asserted. "A high gasoline tax creates antagonism among visitors, because they feel they are being exploited, and no one likes to feel he is being made a 'sucker'. By reduction of gasoline-tax rates wherever possible, this sales resistance can be broken down, bringing an increasing number of visitors and more business to the region.

"Lower taxes would also stimulate greater use of vehicles by motorists who now reside within the high gasoline-tax belt. The chief expense of motor-vehicle operation is the cost of motor fuel, which is arbitrarily raised 50 per cent. by the present gasoline tax imposts in these states. It is obvious, therefore, that taxes as high as 6c., 7c., or 8c. a gallon seriously curtail motor vehicle use.

"In the nine southeastern states the gasoline tax bill of the typical motorist is about $48.00 a year, nearly half again as high as the average for the country as a whole. This gasoline-tax bill, together with registration and license fees and Federal excises, constitutes a total annual levy roughly of $63.00. This is nearly one-third the value of the average automobile; and when we remember that the typical motorist earns only between $20 and $30 a week, it is apparent that he must work between two and three weeks each year just to pay his automotive taxes.

"One might assume that high gasoline tax rates would assure good roads, and that the higher the tax rate the better the road, but nothing is farther from the truth. On the contrary, high taxes reduce the number of cars on the road, cut down the number of taxpayers, reduce automobile use, increase tax evasion, and add to the work and worry of the state tax collectors, who at best have a thankless job. They also encourage the misuse of highway tax revenues.

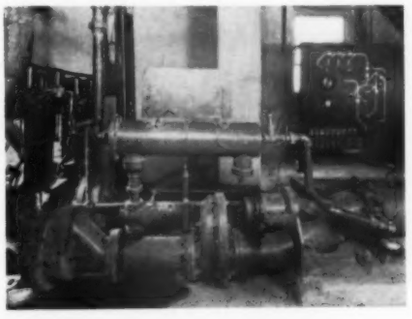
"Last year in the eight states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, South Carolina, and Tennessee the U. S. Bureau of Public Roads reports that about $20,000,000 of highway-tax money was diverted to non-highway purposes. This means that the motorists of these states not only paid the cost of maintaining and constructing the highways, but they also paid $20,000,000 additional into the general funds of their states. This is another cause for high gasoline taxes.

"Sentiment is definitely crystallizing against the use of highway-tax revenues for any other purpose than roads, and in some states efforts are now being made to prevent future misuse of road funds by the adoption of amendments to their state constitutions. If constitutional amendments of this kind are the only means of halting diversion, I recommend this procedure for all the states in this region, for substantial tax relief will continue to be jeopardized so long as diversion exists. Perhaps elimination of diversion would make possible a reduction in the gasoline tax averaging 1c. a gallon.

"Another hope for the southern motorist lies in the Federal motor fuel tax, which is due to expire in 1939. This tax, levied as a temporary emergency measure, is unpopular throughout the country and constitutes the added straw which is gradually breaking the motorist's straining back. Finally, the increasing highway revenues resulting from larger registrations and wider use of the cars previously registered may make still further reductions in state tax rates possible."

Allentown *(from page 48)*

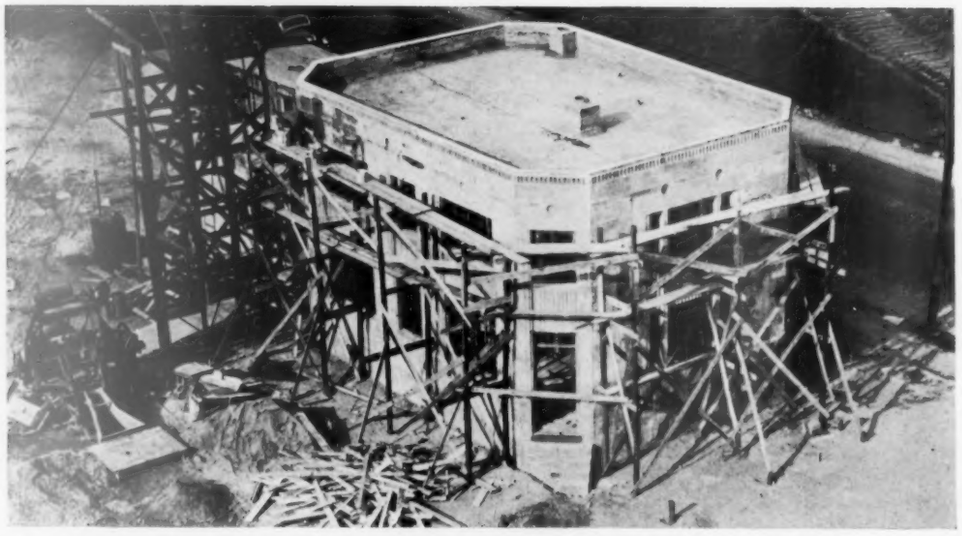
of 15,000-cu. ft. per min. capacity is connected to the raw-grinding department. Two new and similar Dracco collectors are connected to the clinker mills at their discharge points. The



Discharge end of the pneumatic conveyor pipe-lines beneath the blending silos.

dust collected is carried by two screw-conveyors to the separators. Clarage fans are used in connection with these dust-collectors.

With the plant-improvement program well under way, considerable attention is being given to improving the appearance of the property, including the reconstruction of existing buildings. Some landscaping has already been done and concrete roads are being built. In 1936 the company built sixteen houses of concrete block with asbestos-tile roofs. These are being leased to employees at a very low rental.



SAFE FROM FLOOD DANGER

Rising flood waters from the James River at Richmond, Va., will not harm the office building of the Richmond Sand & Gravel Co. in the future. The monolithic reinforced-concrete building illustrated above was recently completed and will withstand inundation with no more damage than muddied floors and walls which can easily be washed and dried without further ado. Its modern design has created a great deal of interest among architects and builders. Plywood form liners yielded smooth wall surfaces. All ceilings were treated with acoustical tile. The building is completely insulated and fully air-conditioned. The other two pictures show the interior of an office and a construction view. The cost was approximately $17,000, including the air-conditioning equipment.

By W. E. TRAUFFER

Small Plant in Toronto Suburb Sets Example for Producers of Gravel

Concrete sand is produced by this device which dewaters and classifies the material.

The conventional drag-box is employed in the production of masons' sand. The overflow is flumed away and wasted as the illustration shows.

ONE of the outstanding new sand-and-gravel plants of the year is that of J. E. Montgomery at Mount Dennis, a suburb northwest of Toronto, Ont. This is only a medium-sized plant with a capacity of 1,300 cu. yd. in a 9-hr. day, but this output is obtained with little equipment. This simplicity of design is accomplished without sacrificing efficiency of operation or the quality of the product. Above all this plant is definite proof that a small, modern plant designed to supply a local demand can be operated at a profit.

Mr. Montgomery entered the sand-and-gravel business as a teaming contractor hauling pit-run material. In 1920 he began to use trucks in this business, and in 1926 built a small washing and screening plant. This was followed by several other plants, each larger than the preceding one. The present plant went into operation in November, 1936.

The deposit from which this plant is supplied is one of the few suitable deposits close to Toronto. It consists of a glacial deposit of 46 acres estimated to contain about 2,000,000 cu. yd. of sand and gravel. There is a negligible amount of overburden and the deposit averages 30 ft. in depth

Vibrating feeder located between truck hopper and plant conveyor.

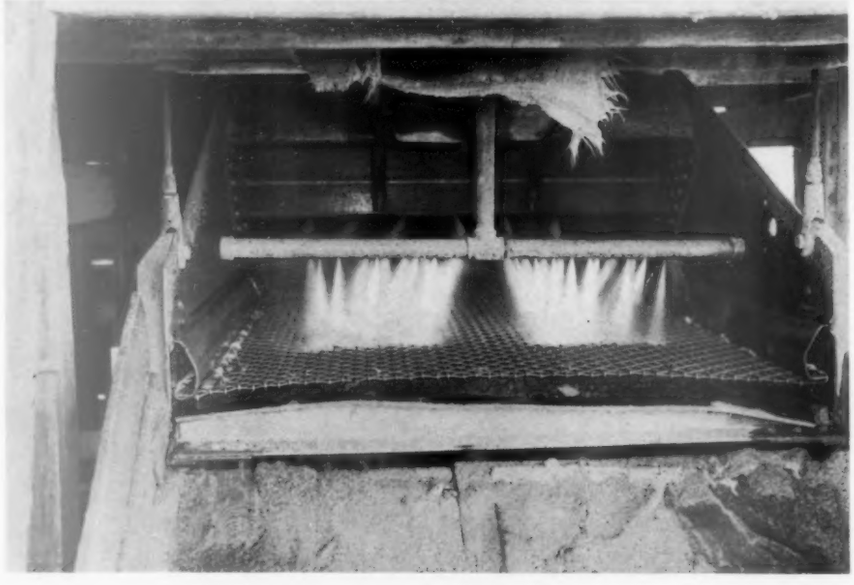
General plant view with truck hopper at right; sand stock-pile and loading bins at left.

to a bed of stone and shale. About 40 per cent. of this material is gravel, of which a small amount exceeds 2 in. in size.

A Northwest No. 25 gasoline crawler shovel with a ¾-cu. yd. dipper loads the sand and gravel into trucks, which haul them an average of about 1,000 ft. to the plant. Three 5-cu. yd. Mack Model AB chain-drive trucks are used for this purpose. Two of these trucks are 1936 models and the other is a 1937 model. All have Gar Wood end-dump bodies and hydraulic hoists and Goodyear pneumatic tires.

At the plant these trucks discharge their contents from a ramp over a stationary bar grizzly having 3½-in. openings. Oversize material, amounting to about 2 per cent. of the total, is wasted at present. The material passing through the grizzly drops into a 30-cu. yd. steel hopper which is amply large to insure a steady flow of material to the plant. A Jeffrey-Traylor 24-in. electric vibrating feeder makes it possible to control accurately the rate of feed from this bin on the main plant conveyor.

This belt-conveyor is 30 in. wide and operates on 140-ft. centers, discharging the material on a 5-ft. by 14-ft. Allis-Chalmers 3-deck horizontal vibrating screen equipped with washing sprays. These decks are fitted with wire cloth with 1-in., ⅜-in. and ¼-in. clear openings. The three sizes of gravel produced are chuted direct into bins below. These steel-braced wooden bins have a combined capacity of 200 tons. Trucks are loaded under them through lever-operated sliding gates.



Triple-deck vibrating screen showing arrangement of sprays.

Wash water is supplied by this 2-stage centrifugal pump.

The sand and water passing through the bottom deck of the screen are flumed into a 15-ft. diameter Link-Belt dewatering Rotoscoop. This machine separates and dewaters concrete sand, which it discharges on a 24-in. by 110-ft. inclined stock-piling belt-conveyor. The concrete sand is discharged on a stock-pile of 15,000 ton capacity.

Gasoline-powered crane loading from stock-pile into a 3-cu. yd. delivery truck.

The overflow from the Rotoscoop goes into a 4-ft. by 28-ft. Jeffrey drag-box, which discharges an extremely fine sand into a pile. The overflow from this drag goes to waste.

A Koehring Model 301 gasoline crawler crane with a 45-ft. boom and a 1-cu. yd. Blaw-Knox clam-shell bucket loads concrete sand from the stock-pile into trucks or into any of six 100-ton timber hoppers used for truck loading. It also mixes fine sand with the concrete sand to form masons' sand and is also used to load out pit-run material.

All the shipments are made in trucks, which deliver to the entire Toronto area. Both the sand and gravel pass all city, provincial and other specifications for concrete aggregate, for which purpose most of them are used. All the material is sold on a yardage basis.

In addition to the three trucks used in the pit the company owns 7 delivery trucks. Four of these are 1937 Mack Model ER chain-drive machines with 8-cu. yd. dump bodies. Three are 1397 Mack Junior Model 37 trucks with 3-cu. yd. bodies. They are also equipped with Gar Wood end-dump bodies and hoists and Goodyear tires.

The plant was designed by J. E. Montgomery and his brother H. A. Montgomery, general manager, with the coöperation of the companies supplying the major equipment. According to J. E. Montgomery, a crusher may be installed during the winter to crush the oversize gravel now being wasted. A larger shovel may be installed in the pit. The present sand stock-piling conveyor will be replaced with a wider belt, which will be extended horizontally at about 60 ft. above group-level to double the stock-pile capacity.

The Link-Belt Co. supplied the Rotoscoop, the belt-conveyor idlers, pulleys and drives. The Jeffrey Mfg. Co. supplied the vibrating feeder and the sand-drag. The vibrating screen and the water pump were furnished by the Allis-Chalmers Mfg. Co., gutta percha conveyor belting and Westinghouse electric motors are used.

Water is supplied to the plant from the Humber River. An Allis-Chalmers 2-stage centrifugal pump driven by a 150-hp. motor supplies 1,800 gal. per min. through an 8-in. pipe 1,000 ft. long against a 100-ft. head. The belt-conveyors are driven by 15-hp. and 7½-hp. motors, respectively, through Link-Belt speed-reducers. The screen and Rotoscoop are driven through V-belts by 20-hp. motors and the drag is driven by a 10-hp. motor. A 2-hp. rotary converter operates the vibrating feeder.

Chilean Cement Firm Aids Workers Welfare

Sociedad Fabrica de Cemento de "El Melon" ("El Melon" Cement Co.) has a virtual monopoly of cement manufacture in Chile and has one of the most important industrial plants in the Valparaiso district.

The company's plant has an annual capacity of 2,500,000 bbl. of Portland cement and is located at La Calera, on the railway between Valparaiso and Santiago. The limestone deposits at La Calera, which serve the cement plant, have been worked since Colonial times and are among the few available in Chile. Capacity has been increased to meet the growing demands of the country.

The company has undertaken an extensive social program for the benefit of its workers. It now has in the course of construction a model township for its employees, which will include two schools for 500 pupils each, a theater, a church, two coöperative stores, a market place, parks, hospital, public bath, laundry, and 500 workmen's houses. The houses are to be constructed of concrete and to contain a porch, living room, three bedrooms, bathroom, and kitchen and are to have such conveniences as sewerage, running water, and electric light.

Lower Rates Follow Accident Reductions

Accident-insurance rates are made up through close adherence to a fixed actuarial system and the real controlling influence is accident experience. Of course, rates vary among various states for they are adjusted to the benefits provided for by the different state laws, but in a given state the rule holds good that the fewer the accidents, the lower the insurance cost.

Some interesting ideas on *How to Reduce Your Rates*, were presented recently to the All-Ohio Safety Congress by E. I. Evans, actuary of the Ohio Industrial Commission. Mr. Evans laid down the following commandments:

"First, prevent accidents by eliminating the cause.

"Second, prevent involvement and infection by insisting that proper attention be given to injuries.

"Third, reduce compensation cost by assisting the injured to obtain early employment suitable to their disability, in other words, rehabilitate your injured employees. If you will not take care of your crippled and injured, how could you expect any other employer to find jobs for them?

"Fourth, reduce medical cost by eliminating excessive treatment and charges. I don't mean by that to incriminate the doctors and hospitals, generally, but there are humans in that profession just the same as in any other profession and I wouldn't think of writing out a blank check to any individual; it is bad business practice.

"Fifth, reduce compensation and medical cost by coöperating in the development of facts bearing upon the merits of the claim."

By H. N. HUNTZICKER
United States Gypsum Co.

CONTROL TESTING AND CONSUMER SATISFACTION*

The attitude of the lime industry regarding the question of whether or not we should employ lime tests lies somewhere between the opinion that a lime test is a necessary evil and the thought that it is impossible to employ too many tests. It is impossible to defend either of these positions, but both are indicative of the cognizance we give consumer demands, which, after all, have been the means of prodding us into greater testing programs.

In establishing a testing program we should strike a mean between these two extremes, and rather than depend on a very large number of tests, put the emphasis on the proper selection of tests, so that test results will actually represent results that the consumer can reproduce in his use of the lime. It seems quite apparent that if both the manufacturer and the customer have in common a reliable method or yardstick for evaluating a lime, we then have an ideal set-up for merchandising lime on its merits, and we have, in addition, a definite mark from which to start in experimental work designed to improve the lime itself and subsequently the process in which it is used.

With this premise in mind, that control testing is a means of shaping lime production to meet the specific needs of the consumer, let us see how adequately we are equipped to do this, how much testing is actually necessary, what is being done to overcome deficiencies in present testing methods, and, lastly, what is the consumer interest in these matters. . . .

Building Limes.—One of the things that will be emphasized throughout this paper is the desirability of having control tests come as closely as possible to being small-scale duplications of consumer practice. For this reason and obviously the best way to determine how a finish coat will apply, and what the workman will find, is to make trial applications on test panels that are preferably not smaller than 8 in. by 8 in. Similarly, the working qualities and sand-carrying capacity of a lime for masonry mortar can best be determined by putting up test mixes and troweling the material on test masonry units.

We have found in our laboratories that these application tests are by far the most reliable for determining the troweling characteristics of a material, that is, next to actual job trials. It is admitted that application tests on this scale are too strenuous for daily use by a mill-control laboratory, but, nevertheless, we are convinced that they should be employed periodically, and at intervals certainly not farther apart than every two or three weeks. This serves to keep a testing staff better aware of the real end of control testing and gives these men something to which they can tie their other test results.

Assuming that we use the panel test as the directing power in our control testing, what, then, are the other tests of a faster nature that we can use, and what properties do we wish to find in order that we can assure ourselves that the consumer will have the most satisfactory experience with our product?

The properties we try to develop in a building lime are mainly plasticity, workability, and extensibility. And, in addition, we have to give careful consideration to the soaking qualities of hydrates and the slaking qualities of quicklimes. A mill-control testing program should include daily tests of 16- to 24-hr. soaking consistencies of hydrated limes, such tests simulating as closely as possible job conditions.

These same test samples may be used to check body and slump of the gelled putty. Changes in the quality of the quicklime or the operation of the hydrator may be followed in this manner. Quicklime products should be checked daily by slaking, and in these tests the slaking consistency should be recorded. Screen tests are valuable for determining the amount and nature of the residues.

The matter of soundness has been given sufficient publicity of late to warrant some discussion. It has been our experience that the best mill-control test we can use is the present tentative A.S.T.M. autoclave test, or something very similar to it. Admitting that accelerated tests are never as accurate as service tests, the autoclave test is very useful in control work with either high-calcium or dolomitic limes. Too much emphasis should not be placed on one 4-in. by 4-in. test plate, however, and since it requires but little more time to put up and steam four or six plates, a multiple-plate test is recommended. Soundness tests should be made most often on finishing quicklimes and finishing hydrates, although in the case of the latter, many of them are fine enough to require the minimum of attention outside a close control of the top particle size. Materials that cause popping are not as dangerous in masons' quicklimes and hydrates in amounts in which they ordinarily occur, but the autoclave test is nevertheless valuable as a control test to determine whether or not the production is running within safe limits. Generally speaking, quicklimes should be tested more often and with more care than hydrates. Obviously, the author is not of the opinion that the same soundness requirements should be put on both masons' and finishing limes, although many of our widely-used specifications do this very thing.

In originally working up this paper some attempt was made to list sets of mill-control tests for hydrated lime and for quicklime. Difficulties were encountered immediately. Dolomite products have certain characteristics that require different tests than do high-calcium products. Different quarries and different plants offer special problems and serve different markets. Each plant, in other words, has at least a few very valuable control tests that are specific to that plant. After eliminating these, and without elaborating further, all control-testing programs should have in common: (1) application tests; (2) soaking tests; (3) slaking tests; (4) some standardized system of putty examination for use on putties obtained in the soaking and slaking experiments which should include (a) plasticity (blotter), (b) soundness, (c) body-slump and gelling characteristics, (d) working qualities; (5) screen tests; (6) water capacity; and (7) sand capacity.

If mill laboratories have access to a well-equipped research and testing laboratory, it is desirable to have this mill-control work supplemented by

*Presented at the 1937 Convention, National Lime Assn.

Emley plasticity tests, photometer values, fineness-modulus determinations, staining tests, etc.

Too much emphasis can not be placed on mill-control test records. No lime plant is without some few complaints from one source or another, and the mill records of tests on shipments are the starting point in running down the cause of the complaint. It is highly desirable that the mill quality man, in close contact with mill tests, gets an opportunity to use his accumulated test data by being put on job complaints periodically. He needs this contact with the customer, or man using the lime, to appreciate the value of his tests, and perhaps, to see where new tests are needed or old ones should be modified best to make his control testing a means of obtaining consumer satisfaction.

Chemical Lime.—The problems confronted in the merchandising of chemical or industrial lime products are considerably different from those presented by building limes, and consequently, control tests must be quite different.

A purchasing agent buying lime for a chemical process is chiefly interested in availability, or, in other words, he is interested in the lime that will give him the greatest yield per ton of lime used in his particular process. Obviously the best test he can give a prospective lime is a trial run in his plant. Here is the lime producer's key to the selection of the control test he should use best to shape the production of his lime to meet the needs of the consumer. The best test will obviously be one that duplicates, or comes very close to duplicating, the customer's process.

No originality is claimed for the idea that a test for availability should be based on the particular process in which the lime is used. Haslam, Adams and Kean[1], Blair[2], Armsby[3], and others have made some interesting contributions along this line.

It is interesting to see what help we get from widely-used specifications on lime for various chemical uses. Out of seven A.S.T.M. specifications covering the use of lime in five industries, we have four requirements covering minimum gravimetric analyses and three requirements for available lime by the modified Scaife method. The only specific references to availability are these three available lime requirements. Yet in the processes covered by the seven specifications we may have not less than thirteen different sets of conditions wherein the lime reacts with thirteen different compounds or groups of chemically-reactive substances. Federal specifications present the same kind of picture.

It is not intended in this discussion to assume that the above specifications setting forth general requirements are anything but valuable assets to the industry. It is only intended to point out wherein there may be dangers in allowing traditional tests to assume too great general use and importance. Accurate test results are of no moment, if the results have no connection with the consuming process and, for this reason, the present purpose is to put some emphasis on the proper selection and evaluation of tests.

Probably the most commonly used available lime test in the lime industry is the modified Scaife test, which determines what percentage of the lime will react with hydrochloric acid. It is interesting to examine some results of available lime tests made by this method on chemical quicklimes and hydrates produced by twenty-two different lime companies representing every high calcium lime producing area in United States. (See Table I) Is it possible that the differences shown by these test results are indicative of variations in yields that would be obtained if each were used in the same water-treatment plant, or, is it possible that these figures represent the relative values of each of these limes for use in liberating ammonia from coke-oven wash liquors, for use in causticizing, or for making lime-sulphur solution? We have no results that indicate this. In fact, lime consumers report variations in lime yields far greater than the differences shown by either the available lime or actual calcium-oxide contents tabulated.

Because there is a lack of correlation between available lime (Scaife) results and process yields does not mean that it may not have value as a control test. In high-calcium plants it has a very definite place in mill-control work as a general check on overburning, underburning, or certain variations in rock purity. Ordinarily the sugar method for available lime is a more desirable control test because it requires less time, but if a customer's specifications are based on some of our standard specifications employing the Scaife test, it is also desirable to use the latter. Some of our specification writers have suggested bonuses for available lime contents above the specified minimum requirements. Although bonuses are very welcome, this situation is unfortunate in two respects: first, because available lime tests made on the same lime in various laboratories often do not check within the limits of a bonus increment, and, second, because there need not be a close correlation between the availability of the lime in the process and the availability of the lime for reaction with hydrochloric acid.

Table II records some available lime results obtained by analysis in three

Table I.—A COMPARISON OF AVAILABLE LIMES (MODIFIED SCAIFE) AND ACTUAL CALCIUM-OXIDE CONTENTS (GRAVIMETRIC ANALYSIS) OF REPRESENTATIVE U. S. INDUSTRIAL QUICKLIMES AND HYDRATES.

Quicklimes

Lime	Total CaO (*percentage*)	Available CaO (*percentage*)	Lime	Total CaO (*percentage*)	Available CaO (*percentage*)
1	98.45	95.4	19	96.33	92.9
2	98.26	96.2	20	97.15	94.8
3	98.22	85.6	21	96.17	92.5
4	97.46	93.3	22	97.48	89.2
5	97.01	96.3	23	97.36	86.9
6	97.79	94.6	24	96.83	94.8
7	96.19	94.5	25	97.52	92.2
8	96.78	89.7	26	97.43	93.7
9	98.13	94.7	27	98.40	94.9
10	97.02	92.3	28	98.55	94.8
11	98.82	97.3	29	98.54	93.4
12	97.08	95.9	30	98.35	93.4
13	98.18	97.5	31	98.56	93.4
14	94.57	91.5	32	96.73	94.0
15	97.61	96.1	33	97.82	96.5
16	99.23	95.3	34	97.30	90.0
17	99.14	97.5	35	96.85	94.1
18	98.44	96.2			

Hydrates

Lime	Total CaO (*percentage*)	Available CaO (*percentage*)	Lime	Total CaO (*percentage*)	Available CaO (*percentage*)
1	73.91	67.0	14	72.83	70.9
2	73.94	71.1	15	72.39	71.7
3	73.10	68.6	16	72.96	70.8
4	74.47	69.8	17	74.63	71.8
5	72.58	68.2	18	74.94	70.0
6	72.25	70.8	19	74.90	70.2
7	68.07	64.3	20	74.69	71.2
8	73.30	70.4	21	74.86	72.2
9	70.73	68.0	22	73.89	70.1
10	68.32	64.5	23	71.28	64.5
11	73.25	61.4	24	71.84	66.0
12	74.50	66.1	25	74.61	70.9
13	72.78	70.4			

(1) Ind. Eng. Chem., 18, 19 (1926)
(2) Ind. Eng. Chem., 18, 389 (1926)
(3) Chem. Ind., 37, 437 (1935)

Table II.—A COMPARISON OF AVAILABLE $Ca(OH)_2$ RESULTS OBTAINED BY SIX LABORATORIES ON PORTIONS OF THE SAME ORIGINAL LIME HYDRATE SAMPLE.

	Sugar Method	Modified Scaife Method
Mill-Control Laboratories		
A	94.5	93.9
B	92.7	91.1
C	94.0	93.9
Consulting Laboratory	95.7	94.9
Research Laboratories		
A	93.0	92.4
B	93.1	93.9

mill-control laboratories, two research laboratories, and one consulting laboratory. Each test was made on a portion of the same lime sample already prepared for analysis, and each test was made by having the analysis follow identical sets of directions. Although the variations in results are unusually great, each of these laboratories had no difficulty in obtaining close checks on its own work. This point is emphasized to show that one laboratory control man will readily detect variations in the run of lime he is testing, but the correlation between his results and those obtained in a consumer's laboratory, or a consulting laboratory, may be quite another story.

The lime industry is rapidly becoming cognizant of the fact that hydrochloric-acid availability is not all-imporant. More thought is being given to settling rates, slaking rates, reaction rates, special analysis, color characteristics, and other properties. This is certainly desirable, but herein we run into the danger of placing too much emphasis on a single property, or the result of a test that applies to one property. For example, certain chemical quicklimes are highly recommended to lime consumers as fast-settling, or slow-settling, when it is well known that the settling rate may vary at least 1,000 per cent. in various processes wherein the lime is slaked by different procedures and under different conditions. Comparative settling-rate determinations are very valuable, but only when they are obtained under conditions that simulate the consuming process.

Tests that bring out individual properties are important in correcting certain deficiencies in a lime product, but often in correcting any one property the adjustment may make the lime less desirable from other angles. The difficulties that may be met in emphasizing a single property test may be illustrated by the data in Table III. These data were obtained on eight samples of quicklimes produced in the same territory and sold for water-treatment work. If we use any one column of results and arrange the eight products according to desirability on the basis of these results, we will obtain a different arrangement than if we selected another column showing another characteristic. The present arrangement finds the best water-treatment quicklime at the top, the others being successively less desirable. To determine this order 5 gal. batches of proper amount of each lime to obtain Chicago water were treated with the complete reaction, agitated, and settled. The speed of reaction, the lime necessary, and settling characteristics were the criteria on which desirability was based. By reacting the lime with water it was possible correctly to evaluate the lime and also evaluate, to some extent, the relative value of each property. Obviously different treatment processes would require variations in test methods.

Table III.—A COMPARISON OF PULVERIZED QUICKLIMES FOR WATER TREATMENT.

Quicklimes in Order of Desirability for Water Treatment	Percentage CaO by Gravimetric Analysis (non-vol.)	Available Lime (Mod. Scaife) (non-vol.)	Dry Screen Analysis Through Mesh			Settling rate. (Percentag Volume at 1 Hr.)	Slaking Rate. (Time for 25 g. of lime to raise temp. of 100 c.c. of water from 25° to 50°C.)
			100	200	325		
1	98.39	95.4	98.9	92.8	86.2	60	4 min. 10 sec.
2	98.55	94.8	100.0	99.4	77.5	70	1 min. 35 sec.
3	98.28	96.2	99.9	97.1	91.3	86	3 min. 25 sec.
4	96.98	96.3	½ in. and down			75	13 min. 10 sec.
5	97.71	94.6	92.8	46.0	32.6	62	4 min. 20 sec.
6	97.42	93.30	72.1	54.2	47.6	92	2 min. 45 sec.
7	97.50	92.25	69.5	46.0	32.6	87	6 min. 20 sec.
8	98.20	85.65	1 in. and down			78	14 min. to max. temp.

Laboratory-scale chemical-process duplication has the same relation to our other tests as have building-lime application panels and test piers to the specific tests for plasticity, soundness, putty yield, etc. The process test is a method of obtaining a mean value representing an evaluation of the lime on the basis of all its properties, each being given its proper factor.

Some of our most interesting and useful control tests along this line have been developed for dolomitic limes, possibly because the available lime test is not readily adapted to a dolomitic lime and is rarely used. We have not been forced to use a traditional test, and have, as a result, developed tests based on the process reaction and conditions.

Interesting, but not strange, is the fact that consumers are giving us our best control tests. The consumer who uses lime for causticizing is not interested in how completely a lime will react with hydrochloric acid; he wants to know how it will react with sodium carbonate, and how fast the resulting carbonates will settle. The test data in Table IV are the results of a test that does these very things. The method of obtaining these data represents the type of control test most applicable for lime to be shipped to the customer who wants a lime for causticizing.

As was pointed out for building limes, it is impossible to present a uniform set of control tests for each plant because of specific quarry and operating problems in each plant. Dolomitic and high-calcium limes offer different problems to the tester because they behave differently and, usually as classes and often individually, serve different processes. The thought to be taken from this discussion, however, includes and goes beyond individual plant adjustments. *Select control tests that come as closely as possible to being duplications of consumer usage.* In this way a control test is not merely a means of obtaining a uniform output, although this is important. It becomes a means of bringing the lime producer and consumer together in a mutually satisfactory relationship that will ultimately result in the improvement of both the lime producer's and the lime consumer's products. With these ends in mind it behooves us as lime producers frequently to give our control testing some necessary consideration to determine whether or not it is performing its proper functions.

Table IV.—TYPICAL DATA SHOWING RESULTS OF TESTS TO DETERMINE THE VALUE OF AN INDUSTRIAL QUICKLIME FOR USE IN CAUSTICIZING.

Settling Time		Phenol-phthalein	Methyl Orange	Percentage Causticity	Lb. Lime per 100 lb. Soda Ash
50 c.c.	2.15 min.				
100	4.15				
150	6.25				
200	8.33	19.5 c.c.	20.9 c.c.	86.6	61.0
250	10.60				
300	13.10				
350	20.00				
387	24 hr.				

CUTTING COSTS WITH THE ELECTRIC ARC

● **By C. M. TAYLOR**
Vice-President
Lincoln Electric Co.

THE electric-arc process of welding is the source of practically unlimited savings in and around nonmetallic-mineral plants. The electric arc is an all-purpose repair tool. In addition to being effective in the repair of broken and worn parts of mechanical equipment, its use in fabricating miscellaneous items of equipment and in erecting various types of structures accounts for remarkable economy in both time and money.

So great is the possibility of savings in maintenance work with electric welding that frequently the electric-welding equipment is paid for on one job. While making possible great cash savings in maintenance, electrically-welded repairs prevent costly delays in operation while waiting for replacements.

Reference has already been made to the great versatility of the electric arc's application. This process can be used to weld any of the metals of which mineral-processing machinery or structures are made. Arc-welding electrodes are available for welding mild steel, high-tensile steel, stainless steel, both 18-8 and 25-12, light-gage steel, cast iron, aluminum, bronze, brass or copper. Electrodes are available also for producing weld metal which will resist any type of wear action in pit and quarry service. Thus, if machinery becomes worn, whether it be due to severe impact, severe abrasion or corrosion, or any combination of the three, weld metal can be applied to the part to provide longer wearing qualities than the part had when new. The total savings made possible by this great versatility amount to thousands of dollars per year.

When electric welding is used to repair mild-steel parts, coated electrodes are recommended because of the greater strength of the weld compared with those made with bare or washed electrodes. The speed of welding is also increased from 100 to 300 per cent. by the use of coated electrodes. The better welds, the lower repair cost and faster operation making speedy repairs possible, all contribute to the great savings.

Parts made of manganese steel are built up by the use of a high-manganese-steel electrode, which provides weld metal that makes the part more resistant to abrasion and wear than it was originally. Wearing surfaces rebuilt with this electrode have a wear resistance equal to that of heat-treated cast manganese steel.

Applications for electric welding in the maintenance of a mineral plant are too numerous to mention. Whenever a machine part breaks or becomes worn, it can be quickly restored to service. This applies regardless of the metal of which the part is made. Moreover, whenever the maintenance department is called upon to fabricate a piece of equipment, this can be done simply and cheaply by electric welding.

Maintenance of Cone Crusher.—Every mineral producer is familiar with the cost of maintaining a cone crusher. In order that this machine may long withstand the severe service for which it is built, it must be made of costly materials. It is an item of considerable expense when any part of such a machine breaks or becomes too worn for further service. The bowl liner and the mantle would cost several hundred dollars, not considering the extra expense due to lost operating time. These parts are regularly reconditioned for service in many plants by electric welding. The cost is only 25 per cent. of that replacing the part and the work requires considerably less time than would be needed to obtain a new part.

Recent examples of savings made in one plant by the use of electric welding include: repairing an $85 gear for $10; rebuilding dipper teeth for a third the cost of new ones; reclaiming shovel traction links, costing $50 to $125, for less than $30; repairing a dipper front at a 75-per cent. saving.

Figs. 1, 2 and 3 illustrate typical mineral-plant repair jobs done by electric welding. Fig. 1 shows a gyratory crusher mantle hard-surfaced ready for service after it had been scrapped following previous attempts to salvage it by other methods. The worn and spalled areas were reconditioned by the application of high-manganese weld metal applied in successive beads by the electric arc. The welding of manganese steel is done in accordance with the following procedure.

Arc-Welding Manganese Steel.—If an electrode designed for the building-up of worn manganese steel parts is used, water quenching should be avoided, since the practice merely sets up sudden localized cooling strains which often result in checks and the subsequent failure of the weld. This type of electrode is designed for use with reversed (positive) polarity. The exact heat used depends upon the mass of the part being built up. More heat

Fig. 1—Gyratory-crusher mantle repaired by arc-welding after previous attempts by other methods had failed.

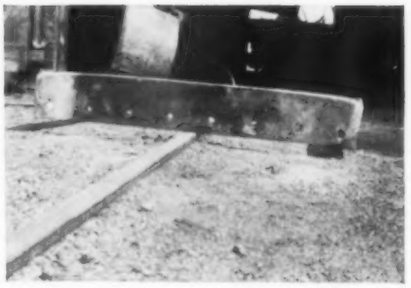


Fig. 2—Bucket lip renewed by electric welding.

Fig. 3—Dipper tooth hard-faced for long service.

is required for heavy sections than for thin sections.

The manganese-steel part to be built up must first be ground free of all rust, spongy or defective material. Suggested amperages follow:

Wire Size	*Amperage*	*Arc Voltage*
$\frac{1}{8}$ in.	50 to 90	24
$\frac{5}{32}$ in.	90 to 130	24
$\frac{3}{16}$ in.	130 to 170	26
$\frac{1}{4}$ in.	170 to 225	26

Wherever possible, the weld metal should be deposited in pads ½ in. to 1 in. wide, preferably not more than 3 in. in length. Long narrow beads

Fig. 4—Track frog fabricated by arc-welding process.

should be avoided. Hammering the surface of the pad immediately while it is cooling stretches the metal and compensates for the shrinkage which takes place in cooling. All slag should be removed from the area where the next pad is to be deposited and it should be cleaned with a wire brush.

Precautions should be taken to avoid the localized heating of manganese-steel castings. The pads should be placed so that the heat is well distributed throughout the casting. If necessary, the casting should be cooled with water periodically to prevent distortion and possible cracking of it.

The lowest heat consistent with good fusion should be used. The deposit should be peened well. The parent metal should be allowed time to absorb the heat from the area of welding and to cool between the beads.

Fig. 2 shows one lip of a bucket. It is now common practice to hard-surface these lips and renew them periodically with electric welding. One plant recently ran a test to determine the effectiveness of this type of repair. The test was made by placing a lip hard-surfaced with electric welding opposite a new lip in the same service. It was found that the hard-surfaced lip outlasted the new one almost two to one.

Fig. 5. Car wheels reconditioned by the application of weld metal.

Bucket dipper teeth (Fig. 3) are kept in condition simply and economically by electric welding. Many plants make a practice of adding to the life of the teeth by the application of weld metal to them before they are placed in service. They are kept in operation for an almost unlimited time by restoring these surfaces when they become worn.

Material-handling equipment adds its share to the cost of maintenance. Prior to the development and application of electric welding the plant owner could do nothing but pay the cost of new equipment when it became broken or worn beyond satisfactory use. To-day tracks and car wheels are not only kept in condition at large savings but the plant actually fabricates many items. Fig. 4 shows a fabricated track frog on which the savings obtained with electric welding amounted to over 50 per cent. compared with the cost of a new frog. To make this frog the steel plate was simply cut to the desired size and the sections of the rails were arc-welded to it. To assure long life the tip of the rails which receives the impact of the wheels as they pass over the cross-over was hard-surfaced with a manganese-steel electrode.

Reclaiming Worn Car Wheels.—The repair of worn car wheels is done in either of two ways. One method, which is illustrated in Fig. 5, consists of applying weld metal to the rim of the wheel and restoring the wheel to its original dimensions by grinding the welds down. Wheels can be reclaimed by this method for an average cost of only $1.20, including labor, material, power and machining.

In reclaiming car wheels by arc welding a high-carbon-steel electrode, containing approximately 100 per cent. carbon, is used. When this weld metal is deposited on straight carbon steel and allowed to cool naturally, the hardness of the deposit will be within the following ranges:

Rockwell C	*Scleroscope*	*Brinell*
20 to 45	31 to 61	225 to 425

In welding the electrode is made

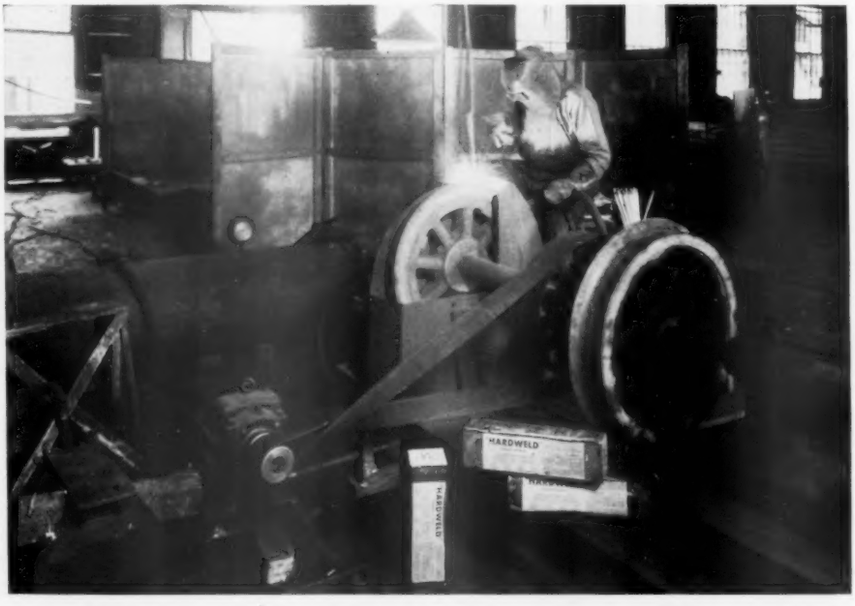


Fig. 6—Arc-welding a new tire to wheel. Tires are bars of steel rolled and attached by means of the electric arc.

positive, the work negative. Wide or narrow beads can be deposited as desired. Each bead should be brushed before depositing the next one. Peening the completed bead will harden the deposit somewhat. Quenching in cold water will also increase the surface hardness.

The deposit can not be machined unless cooled very slowly or annealed. If shaping is necessary, it can be done by grinding. For the best results the work should be as nearly flat as possible. The welding is done by using currents and voltages in the ranges given in the following table for the various sizes in which the electrode is made.

Rod Size	*Current Range*	*Arc Volts*
$\frac{3}{32}$ in.	25 to 70	18 to 22
$\frac{1}{8}$ in.	70 to 110	18 to 22
$\frac{5}{32}$ in.	100 to 150	20 to 25
$\frac{3}{16}$ in.	150 to 225	20 to 25
$\frac{1}{4}$ in.	225 to 350	20 to 25

Another method of reconditioning wheels is illustrated in Fig. 6. In this case the wheels actually have "demountable" tires. After excessive wear has taken place the tires are removed and replaced by new tires arc-welded in position. The savings resulting from this method amount to 50 per cent. of the cost of new tires. The tires are welded and machined for approximately $15, whereas new tires cost, on the average, about $30. Actual reports from plants show that the welded tire gives service as good as, if not better than, that of a new one.

Repairs which are frequently necessary to locomotives can be done effectively and economically by electric welding. These include the repair or replacement of rusted or weakened side sheets in flues, either by the application of layers of weld metal to the thin plate until the proper thickness is secured or by welding a sheet over the damaged area. Other locomotive repairs, such as the mending of broken frames, are made with economy and dispatch.

Other applications of electric welding in maintenance work include vibrating-screen frames; manganese screens; broken truck frames; damaged, weakened or loosened crane booms; crawler shoes; cast-steel racks and pinions; chutes and hoppers; etc. As a matter of fact, whenever metal must be joined to metal, either in the repair of broken or worn parts, in the fabrication of equipment or in the erection of structures of any type, time and money are saved with electric welding.

Low Cost Hauling from Pit to Plant

The plant of the Coogan Gravel Co., near Chillicothe, Ill., is a considerable distance from the pit. Recently a new method of transporting materials was adopted. A crawler drag-line excavates the material, dumping it into an Austin-Western 15-cu. yd. loading bin.

From the loading bin the material is dumped into a Euclid bottom-dump Trac-Truk equipped with sideboards giving it a capacity of 20 tons. It is then ready to be transported 1,200 ft. to the plant.

The material is dumped into the conveyor hopper at the end of the trip. In 11 hours on a typical day recently 114 trips were made, more than 2,200 tons being hauled. Cost per ton on this haul, including maintenance, depreciation, fuel, drivers wages, etc., was $.012.

Research and Development Themes of Illinois Minerals Conference

NONMETALLIC-MINERAL producers of Illinois gathered at Urbana, Ill., on October 8 and 9 for the Fifth Annual Illinois Mineral Industries Conference on the University of Illinois campus. Three sessions were of interest to them—the general meeting presided over by Dr. M. M. Leighton, head of the Illinois Geological Survey, and two other sessions, one devoted to stone, and a joint meeting of stone and clay producers.

At the general session Clyde E. Williams, director, Battelle Memorial Institute, discussed *Research in the Mineral Industries*. He said in part:

"In the dark days of the depression, when national and state institutions were retrenching, the state of Illinois gave its Geological Survey an increased appropriation. The survey capitalized its opportunity and built up one of the finest institutions of its kind in the country. The developments that have resulted from the work of this institution have proved the wisdom of this action.

"By spending important sums continuously for scientific research in the field of mineral industries, this state, so rich in natural resources, will make doubly sure that its people will continue to enjoy the better things in life.

"There are many types of research and many methods for classifying it. In the case of the mineral industry, two broad classifications may be made, namely, (1) research into methods of discovery, mining, preparation and smelting of minerals, and (2) use research, which may take the form of increasing old uses in established indutries, substituting one product for another or developing entirely new uses. Research also may be broadly classified as fundamental and practical. Fundamental research consists in finding facts that may or may not have a practical application, while practical research consists in the application of fundamental knowledge to effect a useful result.

"I believe that research supported by state and Federal agencies should consist largely of the fundamental and pioneering type, leaving it to the industries to carry on the practical type of investigations.

"It has been a satisfaction to me in following the progress of the work of the Illinois Geological Survey to observe that the research investigations have been of a highly fundmental and scientific character, and that its practical investigations have been truly pioneering. This work has already proved of great value to the mineral industries of the state. Research is no longer a hit-or-miss, cut-and-try operation; it can and should be well-planned and carried out by trained experts, using modern methods and equipment developed for the task at hand.

"The state of Illinois is bountifully supplied with mineral reserves. Already it ranks high among the states as a producer of fuels and nonmetallic minerals—raw materials that form the basis for many industries. And who can say what hidden resources may be discovered or what new markets may be developed as a result of research?

"For the iron blast-furnace, the open-hearth steel furnace, cupola, and other metallurgical operations, limestone or lime is the flux par excellence. Likewise, in mortars used in the building industry, lime is almost without a rival. For these uses research into better methods of preparation and improvement of the desired qualities of the product for a given use will continue. Lime also enters into many chemical manufacturing operations and as new products are developed, will find an increasing use.

"The mineral-wool industry may prove a boon to limestone just as the development of the automobile changed the aspect of the oil industry. It is highly probable that this industry may soon acount for an important percentage of the limestone output of this state, and, as a further advantage to the industry, a lower-grade stone may be advantageously used. The Illinois Geological Survey has done a very creditable piece of research work in this field.

" 'Ottawa' silica sand enjoys a wide market in the foundry, both as a molding sand and as a sand-blasting material. Its high purity also makes it desirable as the major constituent in the furnace mixture for making glass, and its physical properties make it an excellent agent for the polishing of glass. Developments in the glass industry are coming fast, new uses, as a result of research work, bid fair to increase the output of glass to an enormous degree. Your silica resources will be an important factor in making these developments possible, and not only will the mineral industry profit, but industrial activity within the state will be increased by the further building up of the glass industry. Improved methods of preparation and especially of purification to bring this material to an even more desirable form undoubtedly will be developed through intelligent research.

"The steel industry is fortunate in that the valuable flux, fluorspar, occurs in the state of Illinois so near to many steel-making operations. Fluorspar manufacturers in this state have done fine work in producing by modern cleaning methods an excellent grade of fluorspar. Producers, however, should be ever watchful that substitute materials may not be proved to be more useful than fluorspar, and should strive through research to improve the quality of the product, decrease its cost and demonstrate its utility. Fluorspar also is used in lead refining and in the chemical industry. It is a useful reagent that deserves the attention of research workers.

"Illinois ranks as one of the largest producers of Portland cement in the United States. The industry is constantly improving its products, making faster setting and stronger cement as well as opening up new uses for this remarkable material. Many opportunities exist for additional developments."

E. J. Krause, president, Columbia Quarry Co., St. Louis, Mo., and president, Midwest Agricultural Limestone Institute, had charge of the stone session, which was opened by a paper on *The Production and Possibilities for Limestone Rubble and Ashlar for Construction*, by W. R. Sanborn,

president, Lehigh Stone Co., Kaukakee, Ill.

"With the depression", said Mr. Sanborn, "came a strange revival of rubble stone, as a facing for buildings. Credit for this revival probably must be shared between the architect and the stone producer who was willing to try anything that might add a dollar to his microscopic income.

"The architect had to exert himself as he had never done before, to find something that would appeal to the few owners who might be coaxed into letting a building contract, and yet had to hold the cost down to a reasonable figure. Rubble veneer, 4-in. thick, not more than 6-in. or 8-in. high, with lengths more than twice their heights, provides the form and the line that the architect must have to please his client, and at the same time, such stones can be set in the wall by brick masons, at a cost not greatly different from the cost of setting brick. . . .

"Color is the last and possibly the most important detail that must be considered. Many limestones and dolomites in the Mississippi River basin offer a variety of warm tan colors, that gave the architect just what he needed to convince the owner that the architect's plans for a home or a church were just what the owner wanted.

"The thin-bedded limestones of southern Wisconsin, and northern Illinois afforded ideal working material, and the depression compelled stone operators to coöperate with the architect, in producing what the architect wanted. . . .

"The possibilities for the future use of this material are rather apparent. The volume is bound to be small; when everyone has a stone house, it loses its charm of individuality. It is a luxury building material, so it will not be used when cost is the controlling factor. On the other hand, it is surprising what an insistent demand exists in certain directions for stone veneer. . . .

"Architects, builders and owners are beginning to realize that they can combine beauty, economy and good construction by using Illinois limestone for veneering exterior walls."

J. E. Lamar talked on *Current Researches on Illinois Stone and Their Relation to Developments in the Stone Industry*. Mr. Lamar is geologist and head, Non-fuels Division, Illinois State Geological Survey.

"Consumer research," he said, "and also the general technical progress in the stone industry, result in new specifications and these new specifications are often written without much consideration of the producer or his raw materials. In many cases then, producer research is the only solution for the maintenance of a market.

"Another development which is significant is the continually broadening scientific and practical knowledge regarding the best utilization of stone products. . . .

"The rise and decline of certain uses for stone is also a development of much consequence. Today filter stone is an important item to the Illinois stone industry.

"Stone, stone products and clay products are approaching a price parity with wood. Here then lies a new field for the stone and stone products industry.

"What can the stone producer do to increase markets beyond probable losses? Research is the most commonly applicable means of so doing and probably in the long run the one which will pay the greatest returns.

"The survey's research program on Illinois stone resources has been planned to encompass the conditions and developments previously mentioned. This program must be an all-industry research program rather than an individual quarry program. The major function of the program is the continuous assembling of data to be added to the reservoir of information regarding Illinois stone. The exact lines which receive the greatest attention vary from time to time according to current needs.

"The work of cataloging the state's stone resources and their properties continues. Recent work has greatly enlarged the amount of information available concerning the limestones of the south half of the state. At the present time it is probable that data are at hand regarding the location of 75 or possibly even 85 per cent. of all the limestone outcrops in the state. In general there is emerging a comprehensive picture of the general nature and distribution of Illinois' stone resources.

"Careful, foot-by-foot sampling of typical critical limestone exposures has been instituted. Thus from a 100-ft. face of limestone 125 samples may be taken. The samples are tested in the laboratory, first, by rapid, rough tests, the results of which, taken together with the field description of the deposits reveal many otherwise obscure data. As a consequence, an intimate knowledge of Illinois limestone deposits is developing which has already demonstrated its practicability and will doubtless continue to increase in value with future developments in the stone industry.

"Emphasizing the property of weather resistance is a project recently started on the soundness of the dolomites in the general Chicago area as a means of securing information regarding the probable weather resistance of a stone in advance of actual use. As a result it is believed important light will be thrown on the following questions:

"1. Which of the dolomite formations of the Chicago area are likely to give superior service under exposed conditions?

"2. How do the freezing-and-thawing, and sodium-sulphate soundness tests compare as means of predicting soundness and how do they correlate with results of actual use?

"3. What textural and petrographic properties characterize Chicago-area dolomites having good soundness?

"4. What criteria based on rapid laboratory tests may be valuable in forecasting the probable weather resistance of the Chicago area dolomites?

"Another major project which will go forward is a continuation of the investigation of the nature and properties of silicate melts resulting from the fusion of silica, alumina, lime and magnesia in varying amounts. Mention of this study has been made at previous conferences as the investigation of the 4-component system, especially in connection with the survey's studies of rock-wool-making materials.

"These four compounds are the chemical keystones of by far the greater part of the mineral resources of Illinois. Silica is the keystone in sands and sandstones, lime in limestone, lime and magnesia in dolomite, and silica and alumina in clays and shales."

The Limestone Needs of Illinois Soils were discussed by E. E. De Turk, professor of Soil Fertility, University of Illinois. Mr. De Turk said in part:

"The soils of Illinois have been formed for the most part directly or indirectly from calcareous glacial *débris*. During the soil-forming period and up to the present, rainfall has been sufficient to provide leaching along with weathering and soil development. This has resulted, first, in the removal of carbonates, producing soils which in their younger stages of development are neutral to mildly alkaline. They are somewhat stabilized in this condition, as to their lime status, because of their content of clay, which has combined chemically with the calcium of the native calcium carbonite, destroying the carbonate but forming a chemical compound which we shall call calcium clay. Eventually, percolating soil waters forced the calcium off the clay particles and out into the drainage, leaving hydrogen-saturated clay, or acid clay. Thus the soil has

gradually become acid. In general the soils of northern Illinois are less mature than those farther south, and neutral surface soils are more frequently encountered. Also carbonates can still be found at depths of 2 to 5 ft., and occasionally at the surface. As one goes southward, carbonates are first encountered at greater and greater depths and the soil becomes more acid in the surface, as well as to greater depths. Local variations in acidity are common and call for chemical soil testing to determine local limestone needs. Cropping and cultivation accelerate the growing acidity of the soil.

"Liming the soil results in forcing the acid hydrogen from the clay particles, its place being taken by the calcium of the limestone, thus reversing the process by which the soil first became acid. The first two to four years after liming a field are required to complete the conversion of the applied limestone over to the calcium clay. In the meantime neutral nuclei develop around the limestone particles, and if these are numerous enough, lime-requiring crops, such as alfalfa and clovers, will thrive within a year or less after liming. . . .

"Fineness of grinding is the paramount factor affecting the above relationship, assuming that the limestone is of satisfactory purity. For example, if the limestone were uniformly ¼ in. in size, and a 2-ton per acre application were made, each particle would have to neutralize 6½ cu. in. of soil—an obvious impossibility. It is for this reason that in developing a score card for evaluating limestone as to fineness, no value is given to particles larger than ¼ in. It does not follow that limestone should be reduced to a powder. A graduation of sizes will make the most satisfactory material when both economy of production and efficiency in the soil are considered, provided the very coarse particles are eliminated. Illinois producers have raised the average fineness rating of commercial agricultural limestone from 75 to 84 during the past 7 years. Some further improvement is still needed, but it is debatable whether Illinois agriculture would profit greatly by increasing the average rating above 90. . . .

"Sources of Illinois limestone from different geological formations vary to some extent in rate of solubility, but the variations are not sufficiently great to justify any discrimination on this basis. . . .

"The use of agricultural limestone in Illinois has grown in the past three decades from nothing to a volume exceeding more than 1,000,000 tons in 1936. No other state uses as much limestone as Illinois. But Illinois farmers could well afford to use much more. Of our 20-odd million acres of cropped land, probably 15 mililon acres need liming, and to supply this need would require approximately 30,000,000 tons of limestone. If our farmers were to apply it at the rate of 2,000,000 tons a year, evidence now on hand shows that the time would be ripe, at the end of the 15 elapsed years to start liming the first limed areas a second time. It appears that natural forces and man's farming the land are combining to provide a lively demand for agricultural limestone for some time to come, and the evidence of field experiments as well as of farmers' experience leaves no doubt that crip increases and better balanced cropping systems will make it profitable."

Ernst Lieberman, chief highway engineer, Illinois Division of Highways, spoke of *Current Developments in Stabilized Gravel and Crushed-Stone Roads.*

"The stabilized road as designed and built actually involves nothing essentially new in materials or construction except the application of some sound basic characteristics and theories affecting the blending of the materials and then proper construction methods and maintenance to obtain a resulting product in which the voids have been reduced to a minimum, in which enough clay has been introduced to give satisfactory binding qualities, and which will have a density to the highest degree possible to prevent the entrance of capillary water," he said.

"An ability to vary the gradation of aggregates to a limited extent affords an exceptional opportunity to utilize materials from ordinary commercial pits and to develop local gravel and stone deposits at a very reasonable cost. . . .

"The theoretical stabilized mix is one in which there is enough of the sand and clay or soil mortar to fill the voids in the coarse material, with a slight excess. . . .

"A question is often raised as to the relative values of broken stone and gravel, and local and commercial products. Another question is whether or not the soil mortar or fines represented by the screenings and dust in a broken-stone mix can be considered of equal value to the mixture of sand and clay in a gravel mix. There is a divided opinion on the theory; nevertheless from the standpoint of construction results, a mix of broken stone, screenings and stone dust has proved satisfactory. . . .

"The demand for a large volume of aggregate for stabilized roads may prove the logic of the producer adding the proper amount of fines and clay before shipping to the job, and it is my opinion that as soon as he realizes the field which is now open for him to furnish materials for bases and surface courses of this character, he will meet this problem. A correct gradation of all the component materials by the producer would eliminate all the expensive job mixing.

"It has been definitely demonstrated that the stabilized road will not compact thoroughly or 'make' except under continued traffic and at least 30 days maintenance should be provided to work out soft spots and insure proper interlocking of the aggregate. . . .

"Naturally the one interesting question to us all is the place, the scope, and, finally, the future of this particular type of construction; I refer to the secondary-road system, which seems to be well established now in our highway program. The secondary system fits well into the picture as the logical place for the stabilized road because of its moderate cost and reasonable maintenance under moderate traffic. . . .

"While the stabilized gravel or broken-stone road has not been adopted by all counties, nevertheless the work which has been done under state supervision has served in a large measure as an object lesson, with the result that many of the counties have begun to appreciate the advantages of this particular type of construction. A few figures may be of interest to material producers. The state under its own supervision has constructed in the past four years 587 mi. of gravel and crushed-stone roads, of which 444 mi. have been stabilized. Gravel or broken stone road construction by the counties and cities, with M.F.T. funds, is even more significant as the figures for the past four years will show: 1934, 313 mi.; 1935, 389 mi.; 1936, 659 mi.; 1937, 600 mi. (estimated).

"On county and city work quantities vary between rather wide limits, but a safe average would be 1,500 cu. yd., loose measurement, per mi. The future on the county and city M.F.T. work, judged by the past, may easily average 500 mi. per year. These rather approximate estimates should show aggregate producers the present trend.

"Thus far, our own experience justifies the stabilized aggregate, but its economic development calls for a thorough coöperative study between the engineers of the highway department, the material producers, the equipment manufacturers, and the contractor. . . .

"Judging the future by the past few years, it does not seem an irrational assumption—rather a low conservative estimate—to state that the material producers and the contractors alike have a definite outlook in the stabilized gravel or broken-stone road during the next decade.

The joint session devoted to a discussion of stone and clay was presided over by S. A. Phillips, directing editor of PIT AND QUARRY. The first paper, by J. E. Lamar, dealth with *Unexploited or Little Known Industrial Minerals of Illinois*. Extracts from his paper follow:

"The potash-bearing rocks of Illinois of possible commercial significance are of two major kinds—shales and greensands. In both of these materials the potash is probably present mainly as a part of the mineral glauconite, which is essentially a hydrous silicate of ferrous iron and potassium. The mineral is green in color, hence the name greensand for sands rich in glauconite. . . .

A potash-bearing shale, the Mountain Glen formation, 35 to 45 ft. thick, outcrops at a number of places in Union County. Several deposits favorable with respect to quarrying conditions and railroad transportation have been described. This shale has an average K_2O content of 5½ per cent. and appears to be quite uniform with respect to potash content. Sixty-two per cent. of the potash in a sample studied in detail was removable by extraction with sulphuric acid and pot-culture tests indicate that the acid-extractable material is largely responsible for the fertilizing value of the shale. A series of greenhouse pot-culture tests were made in which various combinations of lime with kainit, alunit, leucite, and Mountain Glen shale were employed. The results of this work led to the following conclusions: 'The pot-culture work in the greenhouse indicates marked benefit to crops resulting from application of shale. The results are so striking and of such possible economic development as to warrant more extended investigations, particularly in the field. It is quite evident that the potassium in this shale can be directly used by crops in pot cultures under greenhouse conditions.' No commercial exploitation of this shale has occurred to date. . . .

"Deposits of greensand have been observed in the vicinity of Olmsted in southern Illinois. The exact thickness of the deposits is not known, but a 4-ft. greensand bed separated from another 3½ ft. bed of greensand by 1-ft. of conglomerate has been described. This deposit analyzed 6.22 per cent. K_2O, most of which probably was present as a constituent of the mineral glauconite. Detailed search may reveal other deposits of greensand in southern Illinois of sufficient size and having thin enough overburden to be workable on a moderate scale, but in general a thick, unconsolidated overburden is likely to be found on most deposits. . . .

"Sand of various types are widespread throughout Illinois. In the northern part of the state glacial or related sands, most of them calcareous, are abundant and in this area likewise occur the unexcelled silica sands of the St. Peter formation. Sand is also abundant along Mississippi, Illinois and Wabash Rivers and adjacent areas; some of it is calcareous, most of it is not high-silica sand. In Alexander, Pulaski and Massac Counties of extreme southern Illinois sands of an entirely different age than those mentioned are to be found in deposits of considerable thickness and extent. Mostly the sands are medium or fine-grained, but in Alexander County coarse sand is also present. . . .

"The term marl is popularly used in Illinois to describe any incoherent deposits consisting principally of $CaCO_2$. Shell marl is one general type of material to which the term is applied and it is likewise used to describe spring deposits. Materials of the latter type have been observed at several places in Calhoun County, in Bureau County in Fairies' Park in Elgin and other places north of the park on the east side of Fox River valley, and near Danville. In general these deposits are small and solely of local significance as sources of material mostly used as agricultural limestone.

"Gypsum and anhydrite are two minerals which are closely akin in chemical composition, the difference being that gypsum is calcium sulphate plus 2 molecules of water, whereas anhydrite is calcium sulphate without any chemically-combined water. The water which the gypsum contains can be driven off by proper heating and the burned material when wetted again takes up water to give a compound having the original gypsum composition. This last is the familiar action which occurs in the setting of Plaster of Paris.

"Anhydrite, since it contains no moisture, does not possess the properties of gypsum just described. Consequently it has to date not been a widely-used mineral. Due, however, to the fact that it is often found in large amounts associated with gypsum, a considerable amount of research has been devoted to the finding of major uses for this material, particularly in the field of building materials. Successful research resulting in the commercial manufacture in England of a finish-coat plaster, partition tile and "fine-aggregate walling" has been reported recently. Further research may soon broaden considerably the field of usefulness of anhydrite.

"The existence of deposits of gypsum and anhydrite in Illinois is not generally known, however, considerable thicknessess of these materials are present in places. . . . The minerals occur in the upper part of the St. Louis formation at depths of 1,200 to 700 ft. or less. Unfortunately most of the data regarding gypsum and anhydrite come from churn-drill records which do not make possible accurate evaluation of thicknesses; however, several diamond-drill cores are available which give a clew as to the probable nature of the gypsum and anhydrite deposits. . . .

"In Calhoun County there outcrops a stratum of resin-bearing limestone which so far as is known is not duplicated elsewhere in the state. The deposit is probably a part of the Decorah formation and underlies the Kimmswick formation which is a high-calcium limestone. The extent of the resin-bearing limestone bed has not been determined but it appears likely that it underlies a considerable area. An exposure in the NE. ¼ SE. ¼ NE. ¼ sec. 6, T 12 S., R. 2 W., shows 7 ft. of the limestone and this represents only a part of the total thickness of the bed as the bottom of the stratum was covered by stream deposits.

"The resinous limestone is a chocolate brown but weathers a light gray or almost white. It occurs in beds 3 to 6 in. thick, and thin partings of shale are present between some of the limestone beds. This shale will burn when ignited with a match. . . .

"The chemical composition of this limestone compares favorably with some natural cement rocks used for making natural cement, though many of the limestones so used are higher in silica and alumina. Whether the rock can be used for making natural cement or some other similar product has not been investigated, but the unique combination of low iron content and the resin fuel is of interest. Possibly the presence of resin alone is sufficient to justify description of the limestone and the possibilities for the recovery of this resin may bear study.

"The deposit is located about 1½ mi. from Mississippi River and about the same distance from a power-transmission line. No railway transportation is available. Conditions for

underground mining appear to be good."

Magnetic Separators and Their Possible Application to the Beneficition of Illinois Mineral Industries were discussed by J. J. Ferris, chief engineer, Dings Magnetic Separator Co., Milwaukee. He said among other things:

"In general, magnetic separation can be divided into four classificatons. The first and most common is the removal of tramp iron, such as nuts, bolts, coupling pins, etc., from material going to crushers, pulverizers, grinding mills and similar equipment. Tramp iron passing into a grinding circuit causes considerable damage and often fires; and a magnetic separator properly applied prevents this. Some of the materials being so treated in Illinois includes coal, gypsum, fluorspar, and many others. The most popular type of magnetic separator used for this application is the magnetic pulley, but where a magnetic pulley can not be installed, a spout magnet, which becomes part of the spout or chute, or a suspended magnet, may be installed with satisfactory results.

"The second general classification is the removal of deleterious iron, such as scale, iron of abrasion, and other iron oxides, from materials which are so contaminated. For this application many standard and special type separators are available, and recent improvements in high-intensity magnetic separators has widened this field considerably. Typical applications include the purification of glass sand, bauxite, fluorspar, clays and other materials.

"The third classification is the reclamation of materials. Occasionally, the iron only is wanted, but more often two or more materials are mechanically combined, and the mixture, as such, is practically valueless. After separation, however, the value of each separate material is increased considerably. The separation of ferrous and non-ferrous borings and turnings, the recovery of iron from foundry refuse, and the separation of iron from slag, are but a few examples of this application. The type of separator required is the medium-intensity machine, and the size and style depend, of course, upon conditions. . . .

"The next most important nonmetallic mineral in Ililnois is silica. The Ottawa sands are world-famous. Most of this silica, existing as St. Peters' sandstone, is found in Kendall, La Salle and Ogle Counties. When these deposits were formed, very little native iron found its way there. To be sure there is considerable animal and vegetable matter associated with this silica, but by washing these two are very readily eliminated. Further, much of the small amount of iron encountered exists in the form of oxides or rust. That, too, is quite easily washed off in part, but native magnetite and fine iron or abrasion is extracted by magnetic separators.

"Without thorough washing and magnetic separation the average so-called Ottawa sand never ran over .04 Fe_2O_3. Washing and separation easily brings that iron content down to .025 Fe_2O_3 and much of the sand, when thoroughly processed, will run as low as .014 Fe_2O_3.

"In many parts much more money is spent to produce silica containing .06 Fe_2O_3. As stated, the Ottawa sand is world-famous because of its low iron content, its fine structure and its proper alumina content, and other good qualities; and Ottawa could very nicely get along and compete with other sands by merely washing and drying, but in order to excel all other sands offered they do separate magnetically with both medium- and high-intensity separators, and that brings about the willingness of the discriminating user of sand to pay a premium for the Ottawa sand. That sand is delivered as far east as the eastern seaboard, to upper New York and to the southeastern states. Other sand producers who can not produce such high quality have their shipping areas rather limited and they must be content also with a lower price for their commodity."

A Summary of the Results of a Study of Methods for Bleaching Noncarbonate Industrial Minerals in Illinois was presented by Dr. J. S. Machin, chemist, Geochemical Section, Illinois State Geological Survey. Portions of his paper follow:

"The problem of the removal of colored impurities from nonmetallic minerals will become of increasing interest with the depletion of our relatively-uncontaminated deposits of these minerals. Iron is the colored impurity most frequently encountered and its elimination the most important object of nearly all attempts to bleach nonmetallics. The form of the iron impurities determines the method of attack in any given case.

"Our investigations have been largely concerned with the removal of iron from southern Illinois silica. One of the largest outlets for this material is into the paint and filler industry. It competes in this field with china clay, talc, whiting, ground quartz and sandstone, barite and possibly some other materials. As little as .05 per cent. of iron oxide may discolor the silica sufficiently to render it unsatisfactory for use in paint pigment. . . .

"The methods which have been proposed for bleaching nonmetallic minerals may be roughly classified as follows:

"1. *High-Temperature methods.*—These for the most part depend on conversion of the iron present in the mineral into some compound of iron which is volatile at the temperature at which the process is carried out.

"2. *Leaching with Acids Alone.*—The use of hydrochloric and sulphuric acids to remove iron stains by simple solution and washing is too well known to require general comment. The method is recommended by its apparent simplicity but has complicating factors, the chief of which grow out of the corrosive action of the solutions on plant equipment.

"3. *Leaching with Acids in the Presence of Reducing Agents.*—In favor of these methods may be cited the fact that some of them employ dilute solutions and operate quickly at ordinary temperatures.

"4. *Electrical Methods.*—Attempts have been made to separate finely divided ferric oxide from suspensions of clay by subjecting the suspensions to the action of electric fields. No instance of any signal success in iron removal by this method was found in the literature.

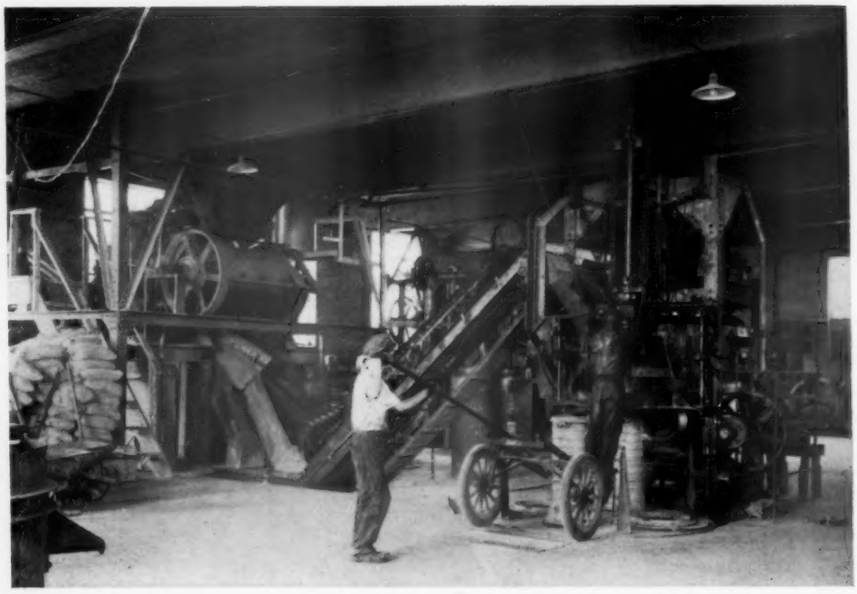
"5. *Magnetic Separation of Iron-Bearing Minerals.*—Recently, due to improvements in design and increased intensity of the fields employed in these machines, progress has been made toward the solution of the problem of removal of iron oxides from some of our nonmetallic materials.

"For certain reasons it was decided to investigate quantitatively methods depending on leaching with acids alone and one method depending on leaching with acid in the presence of reducing agents. Tests were made employing hydrochloric-acid solutions as the leaching agent under varying conditions of time, temperature and concentration. Material ground to pass a 100-mesh screen was used in the laboratory tests. It should be kept in mind that as the particle size goes up the time required for leach liquors to penetrate into the interior of the grains and exercise their action is increased as is the time required to accomplish thorough washing of the bleached material.

"The points which may be counted as favoring the use of hydrochloric acid are: (a) simplicity of the principle, (b) possibility of removing a high percentage of the iron present, and (c) complete removal of acid from the leached silica is easily ac-

(*Continued on page 93*)

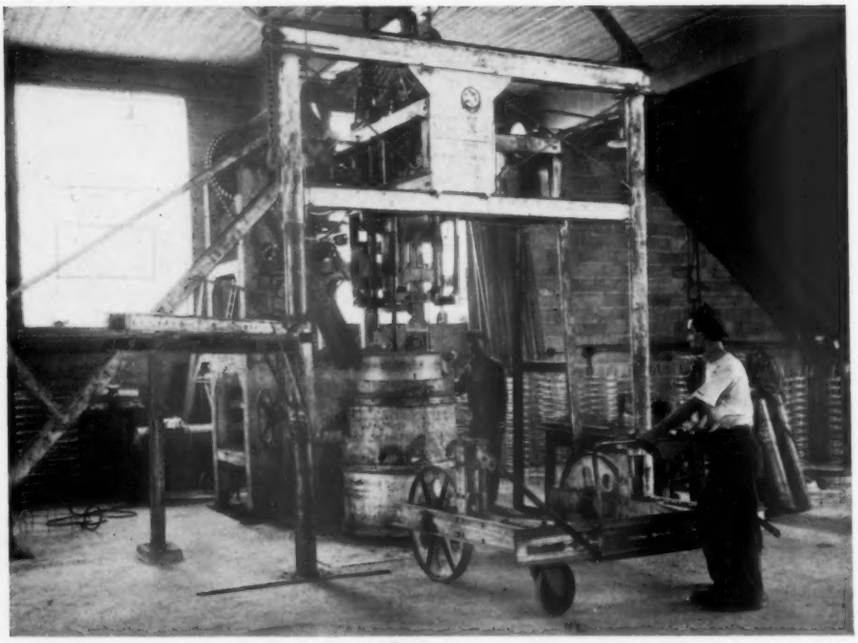
P AND Q
PROFITABLE
New Products
SECTION



The packer-head machine used to make 6-in. to 24-in. pipe. The 30-cu. ft. concrete mixer is at the left.

PRODUCER OF GRAVEL FINDS CONCRETE PIPE IS PROFIT ITEM

WHEN the Gravel Products Corp. of Buffalo, N. Y., was formed in 1926, its name seemed somewhat incongruous, as only sand and gravel were produced at that time. In later years, however, it has become evident that the officers of the company showed considerable foresight in their selection of a name, as sand and gravel products have gradually become the most important part of the company's business. In 1930 the company began the production of ready-mixed concrete on a small scale and this business has expanded to such an extent that it now uses a large part of the sand and gravel produced by the company. Concrete pipe was added to the company's list of products on May 1, 1936, when its new plant at Tonawanda, N. Y., went into operation.



Large pipes—30 in. to 60 in. in diameter—are made with this machine. Elevator from mixer is at the left.

Crushing-and-screening equipment which prepares the aggregates.

The sand-and-gravel and concrete production methods and facilities of the Gravel Products Corp. have been given considerable publicity in the past but a brief description is given in order to illustrate the company's almost ideal set-up for products manufacture. The company operates a 2,300-ton suction dredge boat, the Niagara, which dredges sand and gravel from Lake Erie. This boat is equipped with screens and classifiers, and delivers clean graded material to the company's two yards in Buffalo and its yard in Tonawanda. Each yard has a ready-mixed-concrete batching plant, and a fleet of 19 truck-mixers is operated. Jaeger Dual-Mix bodies and Mack trucks are used. Among the import-

ant contracts filled by the company were 112,000 cu. yd. of concrete for the new plant of the Bethlehem Steel Co. and 63,000 cu. yd. for the Grand Island bridges.

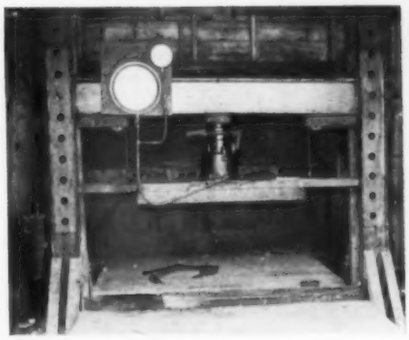
The pipe plant is housed in a 100-ft. by 150-ft. building at one end of the Tonawanda yard. This space is divided up into a 50-ft. by 100-ft. work room and four 25-ft. by 100-ft. kilns. The building has concrete-block walls and a monolithic concrete roof braced with steel girders.

Placing freshly-made pipes in one of the four kilns for curing.

Ordinarily the ¼-in. to ⅝-in. gravel used in pipe manufacture is sized on the dredge and rewashed at a plant on the Tonawanda dock. Sometimes there is an excess of 2-in. to 3-in. gravel and a small crushing-and-screening plant was installed to reduce this material to a size suitable for concrete products. This plant consists of a 40-ton Blaw-Knox steel bin under which is a Kennedy-Van Saun gyratory crusher. A revolving screen equipped with sprays removes the minus ⅛-in. material and the oversize from the crusher product.

All the aggregates for the products plant are brought by scows from the gravel plant a few hundred yards away. A locomotive crane unloads them to stock-piles, to the products-plant bin, or to the crusher-feed bin, as the case may be. This crane also transfers the product of the crushing plant to the products-plant bin.

This 3-compartment Blaw-Knox steel bin has a total capacity of 80 tons and feeds a Blaw-Knox weighing batcher equipped with beam scales. Sacked cement is unloaded from trucks and elevated to the mixer platform, where it is dumped into the Besser 30-cu. ft. mixer along with the batched aggregates. Only two sizes of aggregates are used for all products, sand and pebbles for pipe 30 in. or more in diameter and sand and crushed gravel for 6-in. to 24-in. pipe.



Testing machine for determining strength of the pipe.

head machine is used to make 6-in. to 24-in. plain sewer pipe, 12-in. to 30-in. reinforced bell-and-spigot pipe, and 24-in. and 27-in. reinforced tongue-and-groove pipe. This machine has produced 2,700 ft. of 12-in. plain sewer pipe in an 8-hr. day and averages over 2,400 ft.

Workman welding a wire cage for reinforcing a section of pipe. The rollers at the right are used to form the cages.

The concrete is discharged through a chute arranged so that it can feed the elevators of either of the two pipe machines. The McCracken packer-

The Quinn machine is a medium-duty Type KS pipe machine and is used to make 30-in. to 60-in. pipe of the tongue-and-groove type only, although it can be used for any size from 18 in. up. This machine has produced 268 ft. of 36-in. pipe in 8 hr. Many special products are also made. A P & H ½-ton electric hoist is used to raise the inside cores on this machine.

The pipes from these machines are transported by Quinn or McCracken carts, as the case may be, to the kilns, where the steel forms are immediately removed. After a kiln is filled the pipes are let stand for 3 hr. before live moist steam, supplied by a 30-hp. coal-fired boiler, is turned on. After 2 hr. of exposure to the steam, water sprays are turned on for 10 min. every hour, causing curing of the pipe from the inside out. A temperature of 110

(Continued on page 84)

Plant of the Gravel Products Corp. with aggregate piles and crusher. Some of the pipes in storage are in the foreground.

Newburyport Turnpike shortly before operations were completed.

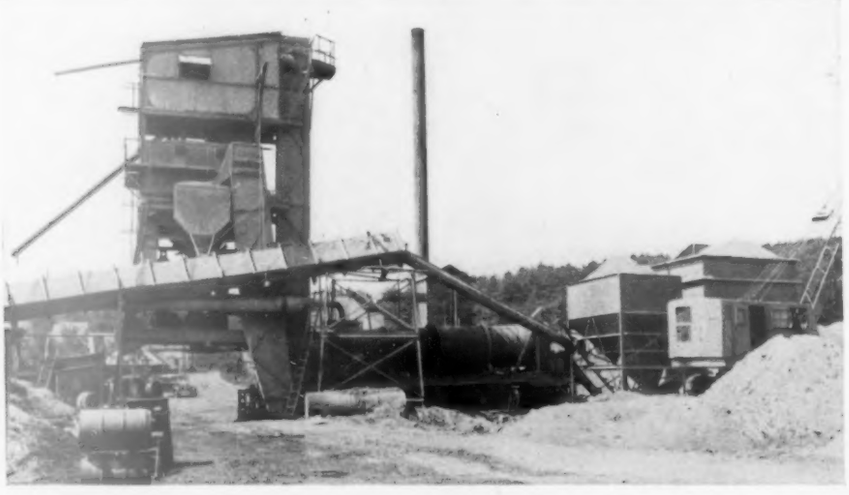
PAVING MIX PREPARED AT STONE PLANT

ONE of the most important highway construction programs in the New England states this year was the reconstruction of the Newburyport Turnpike from Saugus, Mass., north to Lynnfield Center. This highway, U. S. Route No. 1, is the main artery from the Boston metropolitan area to Maine and other northern points. The former double-lane highway has been rebuilt to form two 40-ft. traffic lanes separated by a parkway. This new highway is designed to handle with the maximum of safety and speed the tremendous amount of traffic using this route, especially during the summer vacation season.

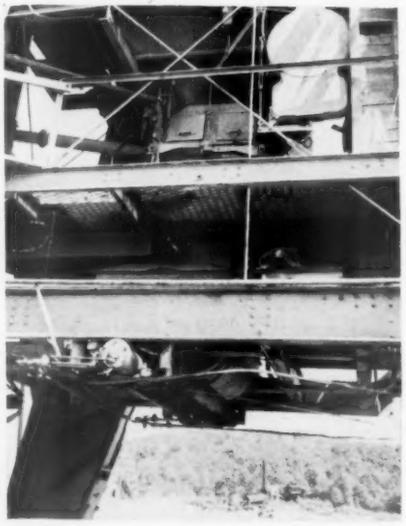
This road was paved with Warrenite Bitulithic bituminous mixture which is patented by the Warren Bros. Co. of Cambridge, Mass. In this highway a lean base mixture with large stone was used as a base course and a denser mix with smaller stone was used for the top course, giving the completed pavement a granular, non-kid surface. The Southampton Paving Co. of Boston, Mass., was the contractor for the laying of the bituminous surface.

To supply the 96,000 tons of bituminized aggregates necessary for this project and some other smaller work in the vicinity a Warren Bros. Roads Co. aggregate-bituminizing plant was erected on the property of the Concrete Materials Co. at Saugus, Mass. This plant, which went into operation in April, 1937, has a capacity of from 1,000 to 1,200 tons per day with a crew of 7 men including the crane operator. The Warren Bros. Roads Co., a subsidiary of the Warren Bros. Co., designs each plant to conform to local, state or city specifications and the desired capacity.

In this plant American Bitumuls Co. 60- to 70-penetration asphalt is used. This is hauled in special insulated tank trucks and trailers from the refinery at Providence, R. I., and is pumped into two 10,000-gal. steel storage tanks at the plant. The tank trucks are equipped with pumps but a Warren steam-jacketed pump in the boiler-house can be used in an emergency. These cylindrical storage tanks are set horizontally. Instead of the usual arrangement of steam coils throughout the tank, a relatively new system, which considerably lowers the heating cost, has been employed. Two vertical steel partitions in each tank extending nearly to the bottom divide them into three compartments. Three steam-heating coils are nested in the center compartment. With this system only the contents of the center compartment, or about one-third of the contents of the tank, are heated to the necessary temperature at any time. As the heated bitumen is drawn from the center or heating compartment, the bitumen in the ends of the tank slumps or flows slowly to the center compartment to become heated to the required temperature.



Plant operated by the Southampton Paving Co. with drier and aggregate bins at right.

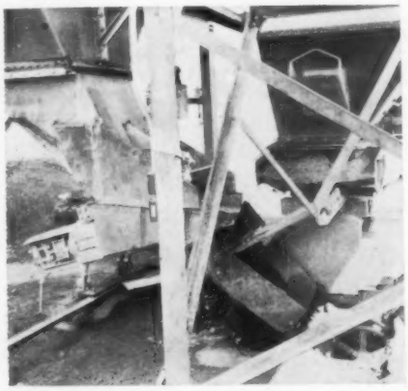


Close view showing batcher and scales over the mixer.

A Warren Bros. 4-in. steam-jacketed direct-connected gear pump connected to the two tanks forces bitumen from either tank into the bitumen-

weighing bucket on the mixer floor. When the plant is in operation this pump works continuously. A steam-jacketed relief valve in the asphalt line to the asphalt bucket opens automatically when the bucket cock is closed and *vice versa*. Thus the bitumen flows in a closed-circuit back into the suction line of the bitumen pump, when the relief valve is open. In this manner a constant supply of hot bitumen is always available. The 3-in. bitumen piping is all steam-jacketed.

The asphalt weighing bucket is steam jacketed and has a capacity of 55 gal. It is equipped with a Howe 2-beam scale with a tell-tale dial. A steam-jacketed valve in the bottom of the bucket allows the asphalt to

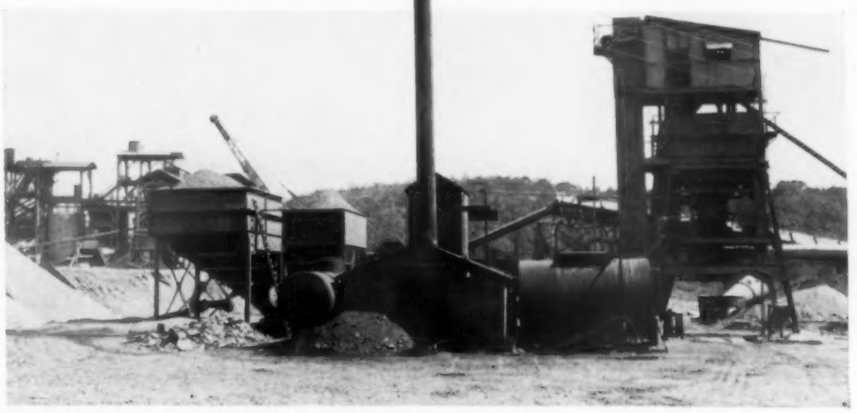


Vibrating feeders which apportion blended sand and stone to bucket-elevator leading to the drier.

flow out through a row of nozzles which distribute it over the full length of the mixer.

Stone is hauled in trucks a distance of 800 ft. from the crushing plant, and is dumped from an elevated roadway into storage bins. Sand is dumped into piles. A crawler clam-shell crane transfers the stone and sand to the steel drier-feed bins. The stone-feed bin has two compartments, each holding 75 tons, and the sand-feed bin holds 75 tons. Arc gates under the two stone compartments allow the stone to flow on a 3-ft. Jeffrey-Traylor vibrating feeder. A gate under the sand bin also serves a 3-ft. Jeffrey-Traylor feeder. These feeders can be adjusted for any desired blend or capacity of sand and stone and discharge the mixture into the boot of a chain-bucket elevator feeding the drier.

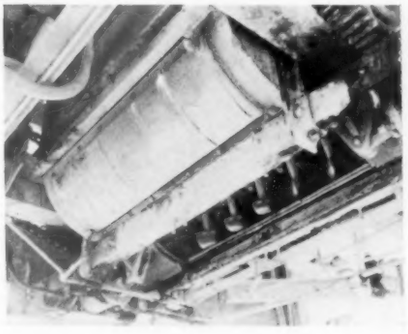
The direct-heat rotary drier is 72-in. in diameter and 30 ft. long and its two tires run on rollers equipped with Timken roller-bearings. The drier is fired with fuel oil through five burners with individual controls that make possible accurate control of temperature which is indicated by a Brown indicating pyrometer, placed in the discharge chute of the drier. The patented combustion chamber of this drier is mounted on trunnions and tires in such a way that it can be rotated manually. By rotating the



Aggregate-bituminizing plant with crushed-stone plant in background.

chamber at intervals different sections can be exposed successively to the most intense heat, thereby lengthening the life of the lining considerably. The drier shell is unlined and has lifting flights to raise and drop the aggregate to aid in the transfer of heat.

Fuel oil of 14 to 16 gravity Baumé is stored in an 8,000-gal. tank. It is



View of the under side of the mixer showing the sliding gates.

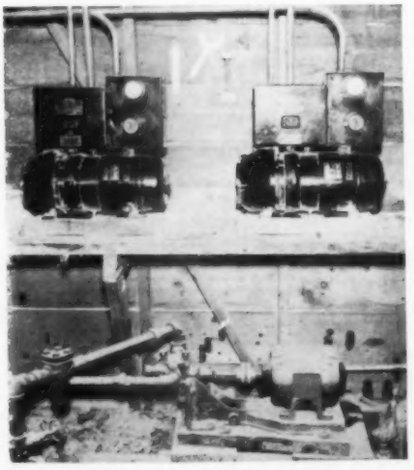
supplied to the burners by a Worthington Duplex pump.

A 60-in. Sturtevant slow-speed fan provides the draft in the drier and blows the gases, vapor and dust into a dust-collector equipped with water sprays to settle out any dust. The dust, negligible in quantity, flows with the water to waste.

The dried stone and sand are discharged from the drier into the hot elevator. This is a fully-inclosed 50-ft. vertical chain-bucket elevator which discharges these materials on a 4-ft. by 12-ft. Robins Gyrex screen having 2½ decks. The products of this screen are sand and three sizes of stone, usually ¼-in., ⅝-in., and 1½-in. These are discharged into the four compartments of a 75-ton steel bin. Each compartment has a lever-controlled arc gate through which the material is discharged into the 55-cu. ft. aggregate-weighing batcher. The four sizes of aggregates and the filler are weighed cumulatively in this batcher by means of a Howe dial scale.

The dust filler is hauled to the plant in trucks, which dump it into a fully-inclosed bucket-elevator. This discharges the dust into a 5-cu. yd. bin. A rotary valve allows the dust from the bin to fall into a 6-ft. screw-conveyor which discharges it into the aggregate-weighing batcher. The finished mixture is discharged into trucks which haul it to the job.

The batched aggregates and filler and the bitumen are discharged into a 2-ton twin pug-mill mixer. The paddles in this mixer have a clearance of only 7/16 in. from the sides and bottom of the mixer, making it self-cleaning. The double sliding gates in the bottom of the mixer are also shaped so that they are self-cleaning and eliminate the pocket of unmixed ma-



Motor-generator sets which operate the two vibrating feeders.

terial which is formed with the use of the conventional type of discharge gates. Each of the two gate sections is operated by a steam ram which slides them quickly apart and together

The 4-ft. by 12-ft. screen which sizes the dry sand and stone.

along the axis of the mixer. These gates are also steam-cushioned to absorb shock and clean themselves as they open.

General Electric motors are used exclusively in this plant. The drier is driven by a 50-hp. motor through silent chain and a ring gear. The same motor drives the draft fan by a flat belt and the cold elevator by a chain drive. The hot elevator is driven by chain from a 15-hp. geared-head motor and the vibrating screen is driven by a 10-hp. motor through V-belts. The dust elevator and feed screw are chain-driven from a 7½-hp. geared-head motor, the operation of the feed screw being controlled by means of a Twin Disc clutch. The mixer is driven by a 75-hp. motor through a Link-Belt speed-reducer and roller chain. The controls for all the plant equipment are grouped on the mixer floor.

A 100-hp. Economic coal-fired boiler, made by the Erie City Iron Works, supplies steam for the plant. In the boiler-room are the two motor-generator sets which supply current for the vibrating feeders.

All the moisture condensed on the steam-heated asphalt pipes and from the asphalt and fuel-oil storage tanks is trapped and discharged into a tank from which it is discharged by gravity into a direct-return trap which feeds this water back into the boiler. A Crane Co. trap system is used. Raw water from a driven well provides the water supply.

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Concrete Pipe *(from page 81)*

deg. F. is maintained in the kilns and the air is kept saturated with moisture. After 48 hr. of this treatment the pipes are ready for use and are moved into the open air. A Byers gasoline crawler crane is used to load the pipes into storage piles where they are kept for from 7 to 14 days before they are loaded by the same crane into trucks for shipment.

The wire used in the reinforced pipe is purchased in 300-ft. rolls. Cages are rolled by a 6-ft. Hendley & Whitmore wire roller and cut with wire cutters. An Allen jaw welder is used to close the cages. A Burke electric-arc welder is also kept on hand to close the rings in bell-type cages and for other work about the plant. An oxy-acetylene welding set is also used for general work about the plant.

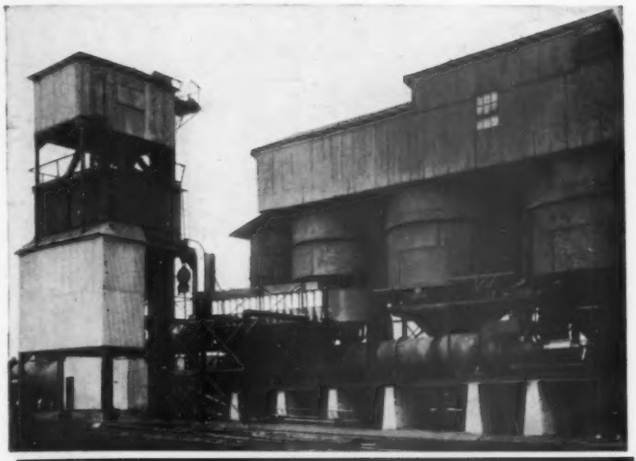
James W. Callahan, production manager of the pipe plant, had been in the products and pipe business for 14-years in Detroit before taking charge of this plant. According to him, a Permanent Concrete Products Co. vibrating table has been purchased for the manufacture of concrete fence posts and later roof-deck slabs. The production of concrete blocks on a small scale may also follow the installation of this table.

A 1:4 true mix of cement and aggregates is used for all pipe manufacture and from 3 to 4 gal. of water is used for each sack of cement. All the pipe meets A.S.T.M. and all other specifications after 4 days. The plain sewer pipe exceeds the strength specification of the A.S.T.M. by 50 per cent. and absorption tests give results consistently under 5 per cent.; the A.S.T.M. limit is 8 per cent. This pipe is used for sanitary and storm sewers and for side drainage on highways. The reinforced pipe is used for sewers and for road culverts. The pipes are tested for strength in a Blackhawk Mfg. Co. 50-ton hydraulic testing machine. The standard 3-edge-bearing transverse-strength test is used.

Froth Flotation of Talc-Tremolite Mixes

Coöperative work with the W. H. Loomis Talc Corp., of Gouverneur, N. Y., was carried out by the U. S. Bureau of Mines during the winter of 1936-37 on separating talc and tremolite from the talc mines of the Adirondak region. Tremolite is related chemically to talc except that lime has replaced a part of the magnesium of the talc. In ceramics mixtures of talc and tremolite have been used to good effect, especially in tile bodies. The object of the work was to prepare purer talc for special markets and to control the talc-tremolite ratio during milling. Much of the talc in these ores is fibrous, although some foliated talc is present. The latter, if separated, is especially desirable in other markets than ceramics, paint, and rubber filler.

All objectives were reached. Talc is a natural floater, and many different reagents will float it. The real problem seems to be one of depression. Other minerals if rubbed with talc on a talcose coating and must be depressed or dispersants or detergents added to clean the coated minerals. This theory was evolved during the work. The best collectors discovered were DP 243, a cationic reagent manufactured by the du Pont company, diamylamine, and the nitrogenous bases extracted from petroleum acid sludges by the Shell Oil Co. in its California plants. An acid circuit, especially during cleaning, is preferred to a neutral circuit. Pine oil or the higher alcohols were acceptable as frothers. Pine oil without any other reagent gave good results on one of the ores from this area.—*1937 Annual Report, Nonmetals Division, U. S. Bureau of Mines.*



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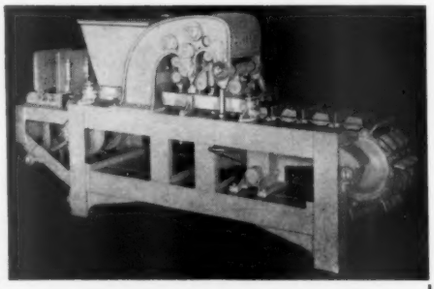

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Petoskey Portland Cement Co.

MEN · OF · THE · INDUSTRY

Seventeen years ago Mr. John was working as a laborer at the plant of the Petoskey Portland Cement Co., having taken the job when he went to Petoskey, Mich., in May, 1920. A little more than a year later he was promoted to labor foreman and in the fall of 1921 he became general foreman in charge of the quarry, crushers and the yard. In April, 1922, he was made assistant to the general superintendent and served in that capacity until Feb. 1 of this year when he was elected vice-president and general manager of the cement company and its affiliate, the Petoskey Transportation Co. He has been a member of the Board of Directors of parent and affiliate concerns since 1926.

Personal Mention

MARK MORTON, president of the Morton Sand & Gravel Co., Chicago, Ill., and a vice-president and director of the Morton Salt Co., was seriously injured on the afternoon of October 2 when the automobile in which he was riding was struck by a train at Wayne, Ill. He was enroute to the sand-and-gravel plant at Munger, Ill., when the mishap occurred. He is 78 years old.

VOLNEY B. FOWLER has been named chief of the public-relations bureau of the general engines group of General Motors Corp., Detroit, Mich. He will supervise publicity in connection with the corporation's Diesel-engine developments.

HENRY G. ROETZEL, one of the organizers of the Hi-Products Rock Co., dealers and distributors of stone at Marengo, Ind., is planning to take several people to Alaska within a short time to do a little prospecting. Mr. Roetzel formerly was interested in a gold mine at Juneau, Alaska.

VICTOR MOTTWEILER, manager of the mineral-wool plant operated at Brantford, Ont., by the Canadian subsidiary of the General Insulating & Manufacturing Co., has resigned and returned to the United States.

LESTER G. SCHRAUB, for the past nine years manager of sales for the wire division of the Sheffield Steel Corp., has been appointed general sales manager of the Union Wire Rope Corp. of Kansas City. Mr. Schraub brings to his new task a background of 23 years experience in the steel and wire business.

TOM B. DOUGLASS of Kansas City has been named plant superintendent of the new $300,000 cement plant built by the Gulf Portland Cement Co. on the north side of the bayou at Houston, Tex. D. J. Morse, formerly of Dallas, is the office manager. The plant, which was scheduled to begin operations Nov. 1, is able to produce 800 bbl. of cement daily.

W. J. STEWART, vice-president of the Marblehead Lime Co., Kansas City, Mo., has retired from active service after 35 years with the company.

E. S. BOSTON has been appointed St. Louis district sales manager of the Patterson Foundry & Machine Co.

P. P. PROCTOR assumed full management of the Rogue River Sand & Gravel Co., Grant's Pass, Ore., on Oct. 1. He recently purchased the interest of C. A. Swope, with whom he was associated in the business for the past five years.

P. E. COMBS, sales promotion and advertising manager of Pennsylvania-Dixie Cement Co., addressed the salesmen's club of the New York Employing Printers' Assn. at the Building Trades Club, Brooklyn, Oct. 11, on "Advertising Needs Industry."

K. A. JOHNSTON, superintendent of the Lafayette Fluorspar Co., Mexico, Ky., spent his vacation on the Mesabi range. He formerly worked for the Oliver Iron Mining Co. at Virginia, Minn.

VICTOR G. FOSHINBAUR of the cement-products bureau, Portland Cement Assn., Chicago, Ill., was in charge of the association's concrete-house exhibit at the annual convention of the Mortgage Bankers of America held Oct. 11-14 at Cleveland, O.

JOHN L. STEWARD has been appointed district manager at Chicago by the Marion Steam Shovel Co. He succeeds JOHN P. COURTWRIGHT who has been transferred to the general offices at Marion, O.

HUGH D. BARNES, former state highway engineer of Kansas, and more recently chief engineer of highway planning for the state, has been appointed regional highway engineer of the Portland Cement Assn. He will cover the Pacific Coast states.

GEORGE R. DEMPSTER, president of Dempster Bros., Inc., maker of the well-known Dempster Dumpster for quarry use, and city manager of Knoxville, Tenn., is a candidate for mayor, Knoxville having chosen to return to the old form of government. Primaries will be held Nov. 13. Mr. Dempster is serving his second term as city manager of Knoxville and was formerly commissioner of finance and taxation for the state of Tennessee.

STOP giving away YOUR PROFITS

Delays in weighing truck loads; "over" or "under" weighing of trucks or car loads; guessing at weights—all cost you money and lose for you your plant's most important asset, customer good-will.

Eliminate these vital losses. Increase your production.

Earn More with a HOWE Weightograph

The Weightograph attaches to your present scale. It gives you fully 75 per cent faster weighing than a straight beam scale. No handling of weights and poises. No squinting at small beam figures. The exact load figures show on the ground glass screen of the Weightograph—large and clear, easy to read at a glance from wherever you stand.

One large producer declares that he sold 250 more tons of sand and gravel through the time saved by Weightograph weighing. It will save for you, too! Write today for information and prices, to The Howe Scale Company, Dept. P-11, Rutland, Vermont.

HOWE Scales of every type for the rock products industry. Railway track, motor truck, batching, etc.

Branches and warehouses in principal cities

HOWE Scales

HOWE FAMOUS FIRST IN 1857

FRED B. HUNT, Nazareth Portland Cement Co., was elected general chairman of the cement section of the National Safety Council at the annual congress held last month at Kansas City, Mo. ALEXANDER FOSTER, JR., Warner Co., Philadelphia, Pa., was chosen general chairman of the quarry section.

O. N. LINDAHL, director, Chicago chapter, Controllers Institute of America, and comptroller and secretary, Universal Atlas Cement Co., presided at the annual meeting of the institute in New York on October 4.

ART LOOS, formerly sales engineer with Iron & Steel Products, Inc., has become manager in charge of buying and selling industrial machinery and equipment for the Triangle Engineering Co., 53 W. Jackson Blvd., Chicago, Ill.

GEORGE C. MCNUTT has joined Bert S. Gittins, Advertising, Milwaukee, Wis., to help handle the agency's industrial accounts. For the past two and a half years he was advertising and sales-promotion manager of R. G. LeTourneau, Inc., Peoria, Ill. Previous to that, Mr. McNutt conducted his own advertising agency and did free lance work on the Pacific Coast for a number of road-machinery manufacturers and construction magazines.

C. J. WILKERSON has established a concrete-brick plant, representing an investment of more than $10,000, in Tucson, Ariz. Cement roofing tile are also to be manufactured.

H. S. SCHULER has been appointed division manager of industry advertising of the Westinghouse Electric & Mfg. Co. according to J. M. McKibbin, sales promotion and apparatus advertising manager.

J. W. KENNEDY, Huron Portland Cement Co., has been appointed a member of the Detroit district committee of the American Society for Testing Materials. The appointment is for three years.

WILLIAM C. CARTER and EDWARD J. BURNELL, in charge of company production and general manager, respectively, at the Chicago works of the Link-Belt Co., have been elected vice-presidents.

WILLIAM J. KELLY, Chicago industrial executive has been elected president of the Machinery & Allied Products Institute, national organization of machinery manufacturers. He succeeds John W. O'Leary, chairman of the executive committee of the Chamber of Commerce of the United States, who will remain a member and chairman of the executive committee of the Institute.

CHAS. H. KEENEY has again become associated with the Connecticut Blower Co. as general manager and chief engineer. He is well known for his inventions and development of air-handling and dust-collecting equipment.

C. Y. FOSTER of Carmel, Ind., has purchased a 40-acre gravel deposit near Noblesville, Ind. Plans for its development are expected to be announced later.

EDWARD L. STEVENS, 43, for the past year manager of sales of commercial wire-rope for the Union Wire Rope Corp., Kansas City, Mo., died suddenly of heart failure on Sept. 21.

OLIVER MILBURN, 48, superintendent of the White River Materials Co., was killed recently while working at the Minnerman gravel plant, on the Wabash River, south of Vincennes, Ind. The accident occurred as a sand chute, which was being installed, fell. Mr. Milburn had worked for the sand-and-gravel company for the past 18 years.

CHARLES M. CAMM, a member of the sales force of the Giant Portland Cement Co. for more than 40 years, died recently at his home in Philadelphia after a short illness. He had been retired for several years.

CHARLES B. CASTEN, 48, vice-president of the Clear Lake Sand and Gravel Co., near Springfield, Ill., died Sept. 23 while at work at the plant. Death was believed due to a heart attack. He had been engaged in the sand-and-gravel business since 1927.

PERCY C. BROOKS, 65, former executive vice-president of Fairbanks, Morse & Co., died at his home in Chicago on October 15 after a lingering illness. He had been with the company since 1898.

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is just as outstanding in quality as a Haiss Loader. SEE BULLETIN 1127 for proof of its simple, strong, HIGH GRADE construction—at a price you can afford. Low receiving end is ideal for unloading hopper-bottom cars.

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The exclusive Naylor Lockseam Spiralweld Structure creates a light-weight pipe of such strength that we can recommend it to carry loads usually possible only with heavier wall pipe.

It provides unrivaled flexibility — conforms more closely to topographical conditions than a rigid pipe structure.

It acts as a continuous expansion joint or safety feature, absorbing shock loads, vibration, expansion and contraction and protects your lines against destructive forces.

These features are not found in any other pipe. That's why engineers specify Naylor Pipe for PLUS performance at LOW cost.

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Foreign Developments

Studies on Expansion Coefficients of Cements

Investigations on the thermal-expansion coëfficients of concretes made with Portland cements, iron-Portland cements, and slag-Portland cements showed that there are no essential difference in the thermal-expansion coëfficients at ordinary variations of temperature when the cements are mixed in standard gravel concrete with approximately 300 kg. of cement per cu. m. of concrete. Beyond that it was found that the thermal-expansion coëfficient of old-gravel concrete made with these standard (German) cements is approximately equal to that of steel and welding iron, but that for iron and concrete in this case should be set at 0.000012, that is, higher than the present conventional value of 0.000010. New-gravel concrete reveals still higher thermal-expansion coëfficients; in the investigations here reported values up to 0.0000156 were obtained. Through the use of admixtures of low thermal-expansion coëfficients and other means it will be possible to accomplish, where it is necessary, a reduction and equivalence with the expansion coëfficient for steel. —Dr. A. Guttmann in *Zement* 26:-614-616, Sept. 16, 1937.

Test Prisms Made in Vibrating Apparatus

Because of the lack of uniformity in the results obtained in bending tests made on mortar specimens made in the ordinary way, hand-tamped, and the labor involved in the tamping, experiments were conducted on the manufacture of test prisms in a vibrating apparatus. No apparatus specifically designed for the purpose was available, but a Vibromax apparatus supplied by a German manufacturer, with a motor delivering 3,000 vibrations per min., was found to be suitable for the experiments. The test results were at least as uniform as in the usual testing on hand-tamped test prisms. The order of the cements in the results of the tests was about the same as in the hand-tamping tests. It should be noted also that the vibrating process corresponds more closely to actual practice on account of the increasing use of vibrating devices for increasing the density of concrete. The vibrating process is independent of man-power and therefore more uniform, requires less time and can be conducted by less highly trained laboratory workers. The values in the vibration tests were in general somewhat higher for bending and compressive tests, less for shrinkage.—Dr. Richard Gruen in *Tonindustrie-Zeitung* 61:749-751, Aug. 26, 1937.

Weight of Clinker as a Test of Quality

The observation of the weight per liter as an indication of a clinker's quality and a method of kiln control is investigated and discussed by Dr.-Ing. Karl Schindler in *Zement* for August 12, 19 and 26, 1937 (26:502-507, 515-518, 546-551), supplementing an earlier work of Wilhelm Anselm (*Zement* 25, 6-633), 1936). Schindler's observations lead him to conclude that a number of other physical and technical properties of cement are dependent upon the weight per liter; that for every cement plant there can be determined a favorable weight per liter which will prevent the disadvantages of over- or underburning. For best bending strength, compressive strength and shrinkage behavior the optimum liter-weight in the case investigated lay between 1.4 and 1.5. In this range also there was the maximum heat evolved in setting, which may be desirable or undesirable, and the maximum hardness, which causes increased grinding work. There was even a parallelism with the apparently unrelated property of diëlectric constants.

A special investigation involved a fused clinker. The accomplishment of the liter-weight effect in the rotary kiln was imitated in the laboratory and progressively measured, and also the specific gravity during the formation of the cement observed. The appearance of a kneading action of the material passing through the kiln was pronounced. The results of the tests showed an extensive correspondence with the experiences in large-scale operation concerning the liter-weight method.

Dr. G. Haegermann, writing independently in *Zement* for August 26 (26:529-530), and referring also to Anselm's work, points out that the method has found only a partial acceptance in practice, and on the basis

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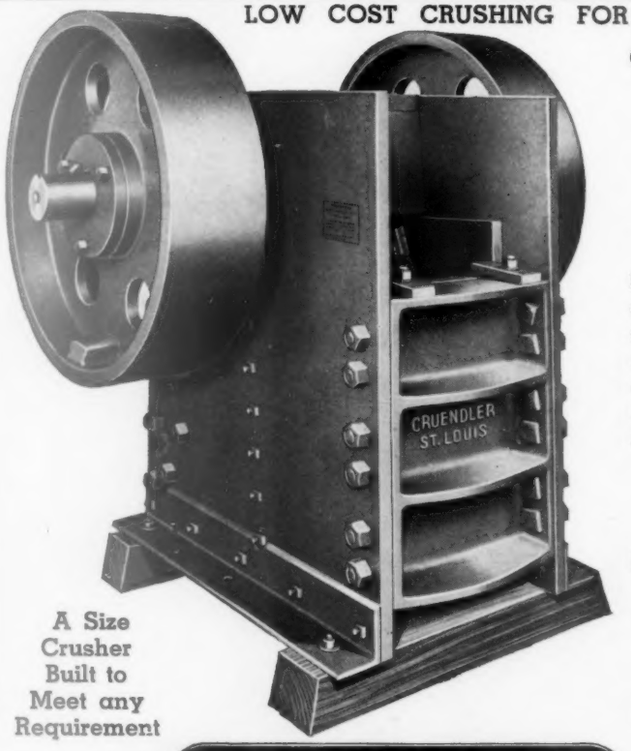

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of experiments he reports, concludes that while the determination of the liter-weight does give an indication of quality when the raw material remains the same, it does not make the soundness test unnecessary.

Resistance of "Gaize Cement" to Corrosion

The resistance of "gaize cement", made by the Societe des Ciments Francais at Boulogne-sur-Mer, to sea water has been reported in previous publications; this article reports on investigations concerning its resistance to the corrosive attack of various other liquids, especially industrial chemicals and liquid products that may be stored in concrete vats or tanks. The "gaize cement" (which contains two-thirds of Portland-cement clinker, one-third of the pozzuolanic component) showed a superiority in every case to regular Portland cement. The time of storage in air between mixing and immersion is of great importance; the longer this time is, the greater is the resistance to corrosion. The decomposition is generally due to action of the injurious product on the lime in the cement, which is easily displaced by sulfuric acid, chlorine, the weak acids, etc. The high resistance of the "gaize cement" is ascribed to the comparatively low lime content and its complete combination, because of the high content of soluble silica provided by the pozzuolanic material.—G. Baire in *Revue des Materiaux de Construction et de Travaux Publics*, No. 331, July, 1937, pp. 142-146.

Research on Constitution of the Fused Cements

Microscopic investigation of the system $CaO—Al_2O_3—SiO_2$ in the range of fused cement led the author to the determination that the compound C_3A_5 does not exist, but that the compound CA_2 is present in place of it. The latter compound has the optical properties that were ascribed to C_3A_5 and melts at about 1,765 deg. C., where it dissociates with the formation of Al_2O_3 crystals. By the application of the same method to the study of a fused cement it was possible completely to analyze the structure and to compute the nature of the components. In addition, the chemical composition was computed from these studies with good approximation to the results of a chemical analysis.—Dr.-Ing. B. Tavasci in *Tonindustrie-Zeitung* 61:717-719, 729-731, Aug. 16 and 19, 1937.

TITANIC TASK

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and ECONOMY!

Cutting the intercoastal canal in Florida — through sand, mud, hard-pan, roots and stumps! Ten million cubic yards to be moved—and this Cooper-Bessemer Diesel-powered dredge pumps 381,000 yards of them in a single month. Dredge men have come from everywhere to see it operate . . . at lowest cost, and always on schedule.

The 16" pump on the Shell Producers Company dredge, "Tennessee," is driven by a Cooper-Bessemer Type JT-8 Diesel, rated 500 H.P. at 400 r.p.m. This engine has seen two years of almost continuous service.

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Occupational Diseases and the Law

Time of Injury

In *Odanah Iron Co. v. Industrial Commission et al.*, decided by the Wisconsin Supreme Court on October 12, a workman had been in a mining company's employ from 1926 until April, 1933, when the mine was temporarily closed down. He was put on "company relief", which permitted him to buy groceries and supplies on credit, to be paid for when the mine was reöpened. On November 29, 1933, he was refused work because of his ill health. The Industrial Commission made him an award upon its finding that at the time of the hearing the workman was suffering from tuberculosis superimposed upon silicosis, an occupational disease, and that the workman has been wholly disabled and incapable of performing work since September, 1933. The award was confirmed by the circuit court and went to the Supreme Court for review. The Supreme Court holds that the relationship of employer and employee was not terminated when the mine was shut down, but continued until November 29, 1933, when the workman was examined and denied work because of his physical condition. The commission's finding that the workman was suffering at the time of the hearing, from tuberculosis superimposed upon silicosis, is sustained; however, the award should not have been based upon wages earned by the workman when the mine was operating on full time (1929 or 1930) but upon the workman's average earning capacity at the time of injury and in the employment in which he was then engaged [Wisconsin Statutes, Sec. 102.11].

Basis of Action

In *Cell v. Yale & Towne Manufacturing Co.*, decided on October 4 by the Michigan Supreme Court, the court rules that injuries received or diseases contracted in employment by reason of neglect of the employer to provide reasonable protective measures are not "occupational", and that an action governed by the law of master and servant can not be maintained against an employer operating under the Workmen's Compensation Act. The plaintiff's action was based on alleged failure of the defendant company to provide appliances to carry off fumes, gas and dust in chrome- and nickel-plating operations; he contended that he had not met with an accident, and was not suffering from an occupational disease, but had been injured by negligence of the defendant company, and since the Workmen's Compensation Act affords no remedy except for accidental injuries, and none for occupational disease, sought to establish that the act did not abrogate the common-law remedy invoked.

Common-Law Allegation

Ziegler, Administratix, v. Henry Maurer & Son, in the New Jersey Supreme Court, involves a claim for compensation at common law for the death of a workman employed by the defendant company to grind bricks, causing fine particles to be thrown into the air, resulting in injuries to his lungs and bronchial tubes. The plaintiff relies on *Smith v. International High Speed Steel Co.*, 120 Atl. 188, which was decided before occupational diseases were made compensable under the Workmen's Compensation Act. The Supreme Court has ruled (September 1) that it is now necessary in such a common-law action to aver and prove such facts as will show that the disease is not one made compensable under the act, as by naming the disease or by setting forth the composition of the particles complained of so that it is clear that none of the compensable diseases would result. Permission to amend the complaint was granted. In a subsequent ruling (September 27) the court holds that the amended complaint does not set up a new cause of action, and that the two-year limitation applies to two years prior to the commencement of the suit.

Common-Law Right

The United States Supreme Court on October 11 denied a petition for *certiorari* sought to review the decision of the Circuit Court of Appeals, Seventh Circuit, in the Case of *Gestauts v. American Manganese Steel Co. et al.*[87 Fed. (2d) 1005], thus terminating the effort to overthrow the Illinois ruling that in that state no common-

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law right of action for occupational disease exists. This action involves neither the earlier Illinois Occupational Diseases Act, which was held unconstitutional, nor the present Occupational Diseases Act which went into effect on October 1, 1936. The workman sued for damages for an occupational disease contracted while working in a steel mill from fine particles of emery silica and metal dust which were thrown into the air. It was alleged that the defendant company had not complied with the Illinois statutes requiring it to correct or eliminate such conditions. The lower Federal court refused to recognize any common-law right of action for occupational disease, on the basis of a decision to that effect by the Illinois Supreme Court, and in denying *certiorari* the United States Supreme Court declines to review the record or alter the decision.

Trade Literature

Naylor Spiralweld Pipe. 40 p. Naylor Pipe Co., Chicago, Ill.

Austin-Western C. E. P. Crushing Plants. 4 p. Austin-Western Road Machinery Co., Aurora, Ill.

Diamond Portable Quarry Plants. 4 p. *Diamond Roller-Bearing Vibrating Screens,* 8 p. Diamond Iron Wks., Minneapolis, Minn.

New American General Purpose Hoist. 4 p. American Hoist & Derrick Co., St. Paul, Minn.

Nordberg-Wood Auto-Vortex Classifier. 12 p. Nordberg Mfg. Co., Milwaukee, Wis.

Brown Pyrometers. 48 p. Brown Instrument Co., Philadelphia, Pa.

Steel Hard-Facing Procedure. 8 p. Linde Air Products Co., New York, N. Y.

Burn All Your Coal With a Detroit Roto-Stoker. 4 p. Detroit Stoker Co., Detroit, Mich.

Diesel-Driven Compressors. 8 p. Chicago Pneumatic Tool Co., New York, N. Y.

Model AG Cletrac Crawler Tractors. 24 p. Cleveland Tractor Co., Cleveland, O.

Fairbanks-Morse Duplex Steam Pumps. 8 p. Fairbanks-Morse & Co., Chicago, Ill.

Belt-Maintenance Manual. 18 p. B. F. Goodrich Rubber Co., Akron, O.

Getting Down to Pay Dirt in Mines, Pits and Quarries. 12 p. R. G. LeTourneau, Inc., Peoria, Ill.

Ajax Flexible Couplings. 20 p. Ajax Flexible Coupling Co., Westfield, N. Y.

Introducing the DA-30 Drifter. 4 p. Ingersoll-Rand Co., New York, N. Y.

Thor-Cochise Rock Drills and Accessories. 60 p. (Catalog No. 41) Independent Pneumatic Tool Co., Chicago, Ill.

Low Head Horizontal Screens. 8 p. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Cedar Rapids Material-Handling Equipment. 16 p. Iowa Mfg. Co., Cedar Rapids, Ia.

Conference (*from page 78*)

complished. Against these advantages must be ranged the disadvantages that: (a) it is necessary to work at or near the boiling temperature to get good iron removal with low acid concentrations, (b) the leach liquors and vapors are highly corrosive, and (c) the cost of hydrochloric acid is high compared to that of sulphuric acid. . . .

"A set of experiments was carried out similar in most respects to those which have been described but employing sulphuric acid instead of hydrochloric acid. As points in favor of the use of sulphuric acid there may be cited: (a) simplicity of the principle, (b) possibility of removing a high percentage of the iron present, (c) sulphuric acid is the cheapest acid, (d) reconcentration of run off or washings might be feasible due to the low volatility of H_2SO_4. As objections to the use of sulphuric acid it may be said that: (a) it is necessary to work at elevated temperatures to get good iron removal, (b) very thorough washing of the bleached silica is necessary because the presence of even small amounts of the acid in the product would tend to make the silica hydroscopic and to react with the paint vehicle, and (c) the corrosion problem accompanying the use of the acid is troublesome, although less so than where hydrochloric acid is used.

"Leaching with acids in the presence of reducing agents has been under quantitative investigation in the laboratory of the Geological Survey. It employs a leach liquor composed of a dilute mixture of sulphuric acid and sodium bisulphite which acts in the presence of an active metal (zinc or iron). Proper combinations of these reagents result in leach liquors which act quickly at room temperature. In a general way the most useful combinations lie in the region where the sodium-bisulphite concentration lies between 5 and and 12 g. per liter and where the concentration of sulphuric acid lies between ½ and 1½ g. per liter. These low concentrations constitute one of the best arguments for the use of this method of leaching because the corrosion problem is much simplified. We have not found it feasible to remove more than about two-thirds of the iron present in southern Illinois silica by this method. . . .

"It is technically feasible to bleach silica by either of the methods discussed. Whether or not it is economically feasible is a question whose answer depends on the extent to which the cost can be balanced by a better price . . . ."

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Traffic News Digest

Examiners' Reports

Amesite—A question of interest to all shippers of materials on which the car load minimum weight is based on the marked capacity of the car has just been considered in connection with a shipment of asphalt-coated gravel from Mayfair, Ill. to Kalamazoo, Mich. made during June, 1934. In this case the shipper ordered a 60,000-lb. capacity car but the carrier for its own convenience furnished a car having a marked capacity of 140,000 lb. The car load minimum weight according to the tariff was 90 per cent. of the marked capacity of the car and nothing was said in the tariff about permitting the use of the minimum weight which would apply on the size of the car ordered. The shipment in question actually weighed 58,700 lb. and charges were originally collected based on this weight. Later the billing was corrected on 126,000 lb. which was 90 per cent. of the marked capacity of the car furnished. The complainant contended that since the carrier had previously furnished a car of 60,000 lb. capacity in which case the car-load minimum weight was 54,000 lb. that he was entitled to the use of this minimum in connection with the shipment in question. Examiner Leland F. James in a proposed report agrees with the contention of the complainant and recommends an award of reparation of $59.22 with interest. I. C. C. Docket No. 27,712 Barber Construction Co. *v* Michigan Central *et. al.*

Sand—Examiner Carl A. Schlager proposes that the Commission award reparation of $70.58 with interest and find that the rates charged on moulding sand from Dorchester, N. J. to Syracuse, N. Y. be found unreasonable to the extent it exceeded $2.40 a net ton plus 7 per cent. emergency charge and from Allegany, N. Y. to Huntingdon, Pa. to the extent they exceed $2.20 a net ton plus 7 per cent. emergency charge on shipments moving during Nov. 1934 and June, 1935. I. C. C. Docket No. 27,605 Pierce Butler Radiator Corp. *v* D. & H. *et. al.*

Recent I.C.C. Decisions

Whiting—The scale of rates charged on whiting for intrastate shipment between points in New Jersey has been prescribed by the Board of Public Commissioners of New Jersey. These rates are lower than those applying on interstate shipments in eastern territory. In an investigation of a probable violation of section 13 the commission has found that the New Jersey rates were not shown to result in undue or unreasonable preference or prejudice as between persons or localities in intrastate commerce on the one hand and interstate commerce on the other or unjust discrimination against interstate commerce and have ordered the proceeding discontinued. In a separate concurring opinion written by Chairman Miller, he states that a study of the level of rates impresses him that the New Jersey rates are too low and that they probably result in a violation of section 13. He further states that there was no definite showing of this in the record which might here have been made by introduction of cost figures and that on the record he felt obligated to concur in the majority finding. I. C. C. Docket No. 27,612 Intrastate rates on whiting in New Jersey.

Traffic News

Legislation—With Congress called into extra session on Nov. 15, the subject of legislation is again of primary importance to the traffic man. Nothing in the proclamation calling the extra session or in President Roosevelt's fireside chat over the radio, which followed the proclamation, mentioned anything about transportation legislation. The subject of governmental reorganization however does effect transportation in a large way since one of the proposals is to take the Interstate Commerce Commission out of the list of independent governmental agencies and to put it indirectly under the control of a cabinet member.

Two bills have been introduced dealing with the reorganization of the governmental agencies. House bill H. R. 8,202 which was passed by the house at the last session would leave the Interstate Commerce Commission as an independent agency except that the budget of the Comission would be passed upon by the executive. The other bill which is pending in the Senate as S. 2,970 which gave the president power to make appointments to positions on the Commission staff. This power of appointment has heretofore rested entirely with the Commission.

Of the other legislation pending that most discussed at the present time is the bill limiting the length of trains to 70 cars which was passed by the senate without a hearing and is now pending before the house committee on interstate and foreign commerce. It has been announced that a hearing will be held before the bill is reported on by this committee. This legislation proposed by organized railroad labor was recommended by its proponents as a safety measure. In a bulletin issued by the Association of American Railroads in which it is contended that the enactment of this proposed law would increase the operating expenses of the railroads by at least $125,000,000 annually. The bulletin has this to say in regard to safety:

"Although there was an increase from 1923 to 1936 of sixteen per cent. in the average length of trains, there has been a decrease in the same period of 61 per cent. in the frequency of accidents to trains and engine service employes. Limitation of freight trains, as now proposed in Congress, would require 78,000,000 additional train-miles to handle the traffic which moved in 1930. On the basis of the frequency of highway grade crossing accidents in relation to the number of trains operated, it is estimated that to limit the length of freight trains to 70 cars would result in 150 more persons being killed and 450 more persons injured at grade crossings each year. The effectiveness of a large part of the improvements made in recent years by the railroads would be impaired if freight trains were limited to 70 cars.

That sentiment in the states is adverse to legislation arbitrarily limiting the length of freight trains is shown by the fact that in the past fourteen years similar legislation has been introduced but failed of enactment in thirty states and in 85 separate legislative sessions."

The Pettengill long-and-short-haul bill pro-

YOUR *Kind of Pipe*

Conveying water over 5,000 feet from river to washing screens.

In this light-walled pipe you have the bursting strength, the collapsing strength and even the stiffness of wrought pipe weighing twice as much. By cutting the weight in half you cut the transportation cost, handling cost, and erection cost. Let Taylor Spiral Pipe cut the cost of water lines and sand or gravel lines. Large stocks and facilities assure prompt deliveries.

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Spiral Pipe Catalog
No. 36

TAYLOR *Spiral* PIPE

posing to amend the 4th section of Interstate Commerce act was passed by the house at the last session and is now pending before the Interstate Commerce Committee of the senate. Other bills which have not been reported out of committees would provide for a 6 hour day and a full crew on the railroads, would provide for a regulation of maritime labor disputes, would give the Commission additional power over through routes and joint rates and would provide for government insured mortgages on vessels constructed for operation on inland water-ways.

Rate Increases—By the time this is published the Commission will probably have rendered a decision in Ex Parte No. 115 which is a proceeding under which the railroads propose to increase the rates on certain commodities. On. Oct. 1 members of the coöperating committee representing state commissions conferred with the Interstate Commerce Commission. In other general cases such a conference of state commissioners with the Interstate Commission has preceeded the report of ahe Commission by a comparatively short time. There have been many guesses as to the amount of increase that will be allowed by the Commission in this case but it is not expected that any increase granted will be sufficient to meet the increased cost of operating the railroads. In fact carriers contend that if they are given all of the increase they ask for it would not furnish sufficient additional revenue to take care of the increased cost of labor and supplies so that the carriers are preparing to ask for another increase in freight rates just as soon as the decision in Ex Parte No. 115 is announced. An alternative would be an increase in passenger fares but southern and western carriers and the B&O railroad in the east have so far contended that an increase in passenger fares will not mean an increase in revenue and that the only way to increase revenue is to increase the freight rates. It is expected that the proposal to increase rates will be in the form of a percentage increase in all rates rather than an increase in certain commodities as requested in Ex Parte No. 115. In speaking before the American Life convention in Chicago on Oct. 12, Donald D. Conn, executive vice president of the Transportation Association of America estimated that the railroads would require an increase of more than $400,000,000 a year to bring the railroad operating revenues into a comparable position in the report for 1936.

In commenting on the procedure necessary for receiving a general increase in rates, R. B. Fletcher, vice president and general counsel of the Association of American Railroads said that in Ex Parte No. 115 a petition of 128 pages had to be served on every member of the Commission bar and others, 10,000 in number; the record comprised more than 7,000 pages; there were 402 exhibits; more than 3,000 pages of briefs were filed; oral argument consumed five days; and on the final application for permanent advances in a selected group of important heavy commodities, the Commission had already deliberated for 115 days.

Motor-Truck Rebates—It seems that there are still a large number of shippers and receivers of freight who do not realize there are heavy penalties attached to accepting rebates on freight charges regardless whether they are made by the railroads or by motor carriers. A number of cases have been prosecuted and fines assessed against both motor carriers and shippers for giving and accepting rebates on freight shipments. The motor carrier act provides heavy penalties of both fines and imprisonment for accepting rebates or concessions or for obtaining lower transportation costs through the filing of false claims or by false billing.

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5909 Kennerly Avenue
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THE Leahy

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There are *screens* and *screens*, but The LEAHY is designed to do one definite job with maximum efficiency—that is, to produce *at low cost* the fine and uniform grading demanded for sand and other materials where extremely rigid specifications must be met.

It operates by a patented differential vibration that is effective over the entire working surface of the screen, insuring extra high capacity. The new and heavier vibrator is dustproof. Only ½ H.P. required. Lowest upkeep is achieved by the rugged construction and correct engineering found in every detail of the equipment.

Write for Bulletin containing available types and sizes

We also manufacture . . .

Spray Nozzles, Sand Classifiers and the Concenco Duplex (Diagonal Deck) Washing Table for sand and gravel. This produces a premium product at minimum cost—handling from 18 to 40 tons per hour.

THE ORIGINAL DEISTER CONCENTRATOR COMPANY
INCORPORATED 1906
911 Glasglow Ave. Ft. Wayne, Ind.

New Machinery and Supplies

• Drag-line

The Harnischfeger Corp., Milwaukee, Wis., presents the P&H Model 955-LC drag-line as a modern 2½-cu. yd. machine to give bigger production on all classes of drag-line work. Following the type of all-welded design used in other P&H excavators, the 955-LC has been stripped of tons of dead weight—making it lighter, faster and easier to move. With an 80- to 100-ft. aluminum boom it has wider working range.

Exceptionally long crawlers, accommodating shoes 30, 36 or 42 in. in width, are of the

The 2½-cu. yd. drag-line.

non-clogging type, have a true rolling action in travel, and are easy to adjust so they can't jump the track.

The 955-LC has a new type fair-lead that keeps the bucket moving faster. Large diameter sheaves are light in weight, roll free and easy. Chilled, curved check plates and easy swiveling action keep the cable properly spooled on the drum and pulling in direct line at all times. Cable wear is reduced to a minimum and a common fault of old-type fair-leads is eliminated.

Rugged, alloy-steel sections are welded together to form a rigid upper revolving frame that has the strength to stand up under severe loads typical in drag-line operation and to keep machinery from pulling out of line.

Hoist and digging drums are mounted tandem fashion to assure true direct line loads from fair-lead to drum. Swing clutches, ride on roller bearings to enable them to stand up under the terrific punishment of moving heavy loads at high speed. This advanced practice makes possible a faster swing, smoother starting and stopping, quieter clutch action and freedom from costly bushing replacements.

The Model 955-LC is powered by a 185-hp. 8-cyl. Diesel engine. Other features include helical-gear-drive throughout, roller-bearing-mounted drums, clutches and shafts, big live roller circle that supports the revolving upper and is tied to the lower car-body by the use of hook rollers to insure perfect balance on long boom operations.

• Air Filter

Like the round-type Norblo air filters which are so familiar throughout the industry, the Norblo square-type filter, produced by the Northern Blower Co., Cleveland, O., is also designed for automatic, continuous service. This model is described and illustrated in a new bulletin just issued by the company.

The air-reversing valve and shaking mechanism used for cleaning the bags are operated by compressed air and actuated by an electrical-timing device. The period and frequency of cleaning the bags may be varied, depending on the dust load handled by the system. These features provide a constant predetermined velocity of air or gas as required in the dust pipe or at the hoods, and give assurance of proper ventilation. Numerous successful installations have been made with this type or equipment filtering dust and moisture-laden gas and air in various industries. The filtering medium may be cotton, wool, glass or asbestos bags, depending, of course, on the nature of the job.

Each compartment, including the hopper, is made up in panels reinforced with angle iron and provided with gaskets for field assembly. Capacities of the installation can be readily increased by adding additional compartments. Four large inspection doors are furnished with each compartment. The sides of the hopper are pitched at a 60-deg. angle and usually furnished with a special screw conveyor trough, having removable sections for center bearings. The dampers may be furnished with leverage for hand or automatic control. Top plates are reinforced with angle-iron and the mechanism is supported by two 7-in. channels extending over the entire length of the compartments.

The air filters are furnished with a common hopper, and the dust pipe or pipes may be entered at any side, due to the large size of this common hopper. It has a tendency to act as a settling chamber and most of the dust and all of the coarser particles will settle in the hopper before reaching the cloth bags, therefore increasing the life of these bags.

The bag holder is a steel frame fastened to the shaking mechanism and provided with a bolt for each bag. The bag cap is screwed on to this bolt and locked in position. The bag itself is strapped to the cap and to the collar welded to the bottom plate.

The cleaning of the cloth bags is entirely automatic, and a very important part of the shaking mechanism is the air reversal valve. This valve reverses the flow of air during the cleaning period and helps to loosen the dust particles from the cloth while the bags are being shaken.

• A.C. Welder

It has long been known that alternating current as taken from the power line could be transformed to produce a welding heat. Due to certain deficiencies in available welding rods, it was necessary to employ a high voltage that was undesirable.

Rod manufacturers have been constantly at work experimenting to produce electrodes that would create a more satisfactory weld. Their experiments have taught them that a flux-coated rod produces a shielded arc which is highly desirable.

With the adoption of flux-coated electrodes, a.c. welding became an outstanding factor in the welding industry. Through the use of

Portable electric arc-welding machine.

much lower voltage the undesirable features of a.c. welders were abolished and all of the advantages were retained.

The conversion of alternating current, as taken from the power line, to the required voltage and amperage for arc-welding purposes is accomplished through comparatively small and light-weight transformers. This

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FOR SAND, GRAVEL STONE, ETC.
Manufactured exactly to your specifications.
Any size or style screen, in thickness of steel wanted with any size perforation desired.
We can promptly duplicate your present screens at lowest prices.
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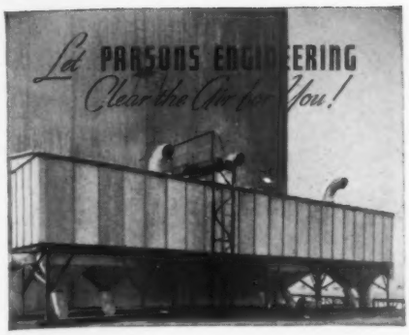

A 15-year record of repeat business would imply that sound Parsons engineering is worthy of *your* investigation, too. Parsons' patented oval bag principle, long life, low dust count and minimum maintenance enable Parsons Dust Arrestors to excel in the cement industry. Write for our Bulletin DA-6.

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3597 E. 82nd St. • Cleveland, Ohio

BAY CITY
for stamina!

MODEL 20
FULL ¾ YD. CAPACITY
4 TON CRANE LOAD
WEIGHS ONLY 10 TONS

Just a few of the 25 Points of Superiority

- Helical cut gears—noiseless, long wearing.
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- Drop forged crawler shoes.
- Chain crowd with automatic adjustment.
- Fast operating speeds.
- Safety worm boom hoist.
- Separate hoist drums.
- Full cab enclosing ALL machinery.

TYPES AND SIZES

Capacity	*Model*
⅜ yd.	20
⅝ yd. (Truck Shovel)	10
⅝ yd. (Tractor Shovel) ¾ Circle	
½ yd.	30
⅝ yd.	38
¾ yd.	45
⅞ yd.	52
1 yd.	62
1¼ yd.	65

The best buy is Bay City

BAY CITY SHOVELS Inc.
BAY CITY, MICH.

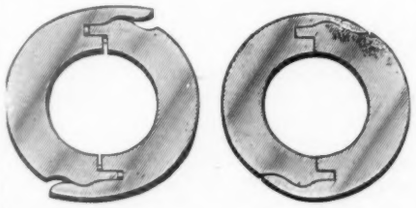
naturally does away with the investment in large and costly motor-generator sets, with their many moving and wearing parts.

The K. O. Lee & Son Co., Aberdeen, S. D., has produced three models of a.c. arc-welders that are proving extremely popular and were the first to be approved by the Underwriters' Laboratories. One of these compact units is illustrated here. They have no moving parts. Complete with accessories, one of these units costs less than a second-hand "flivver" and a single repair job around the plant may more than save its entire cost. A letter to the company will bring complete details regarding these arc-welding units and the amazing things they can perform.

• Repair Washer

The Quick Repair Washer Co., Occidental Bldg., Indianapolis, Ind., announces an improved two-piece split washer and thrust collar that can be assembled on the shafting and securely locked without dismantling the equipment.

These washers have no bolts, lugs or pins to shear off and are made to stand up under the constant use of locomotives, shovels, cranes, excavators, drag-lines, crushers and other equipment used by cement, stone, sand and gravel, and other industrial plants.



Open and closed views of the repair washer.

This split washer is furnished in bronze and malleable iron and in a wide variety of stock sizes; it is also furnished in any special size or thickness. They are recognized by leading engineers as the only practical and satisfactory unit that fills every need where a washer is used, insuring maximum protection against excessive wear to journals, gears and other wearing parts.

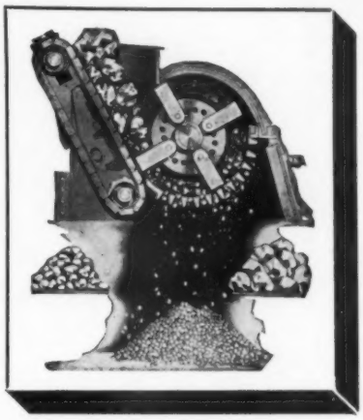
• Apron Feeder

The Link-Track Engineering Co., Chicago, Ill., has introduced the Rorabeck apron feeder which is designed primarily for feeding ore, stone and coal to crushers, pulverizers, screens and process equipment.

"Skyscraper" construction is employed in the design of the Rorabeck feeder. Generous use of heavy channel irons and "I" beams insures perfect alignment at all times and gives ample support to the conveying apron even under the heaviest load.

A combination of welding and bolting provides a rigid structure capable of withstanding the impact of materials dropped from considerable height or with great force, without the usual distortion and stretching of the apron attendant upon such use.

The apron flights are of manganese steel and have reinforcing ribs running their full length. Connecting links are cast integral with flights and are so constructed the fines can not sift through between flights. At the same time, flights flex readily in making the turn, traveling in either direction.



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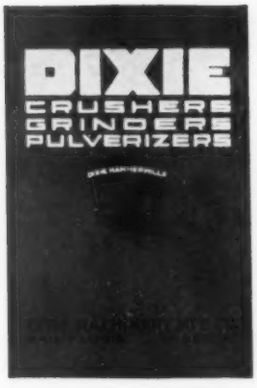
• FORTY • SIZES •

• is the only crusher with a super-tough moving breaker plate that is 26 times the average area. The result is maximum crushing power with minimum maintenance. That is why DIXIE gives record low costs in producing uniform, cubical material.

Built in 40 different sizes for all requirements in Primary, Secondary and Fine Reduction. Write for your copy of the Dixie Catalog, which gives full details and specifications.



DIXIE MACHINERY MFG. COMPANY
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BACON FARREL CRUSHERS

Complete Plants Designed and Equipped. Screens, Elevators, Conveyors, Quarry, Sand and Gravel Plant Equipment. Engineering Service.

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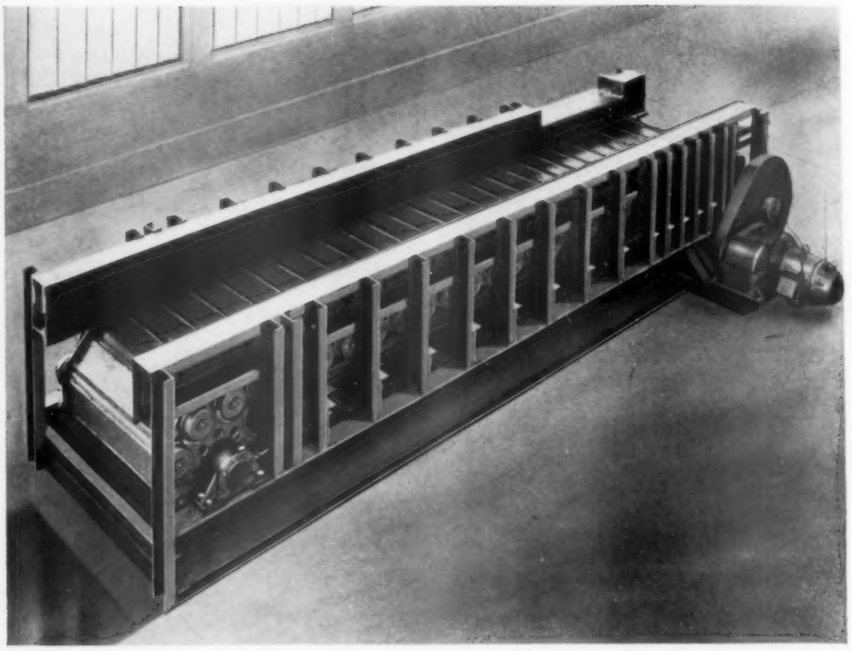


"Skyscraper" construction is employed in fabricating this apron feeder.

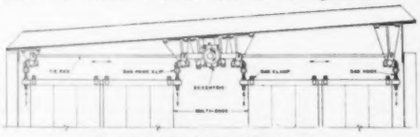
The apron rides on rollers which run on rails. Heat-treated alloy-steel pins or axles pass through the links on the flights supporting the rollers. These rollers engage with the driving and idling sprocket wheels, rolling in and out of the recesses between the teeth carrying the flights smoothly over the turn from where they continue on lower rails. A center set of rollers beneath the flights at each end maintain proper apron tension and prevent flights from bending under load at the turns. Skirtboards are of wear-resistant steel and are close to the apron. Flights have flange outside of skirtboard to prevent spillage.

S. K. F. ball bearings are used on the driving and idling shafts, being enclosed in a dust-proof housing with hardened metal seal rings. Every part which moves is Alemite lubricated. The gear-and-pinion drive runs in an oil-tight housing.

The feeder is reversible and feeds with equal facility and without vibration when traveling in either direction. They are available in any length and a wide range of standard widths.

In DRACCO DUST COLLECTORS FAN POWER is Reduced to a MINIMUM • Get Bulletin No. 302

The DRACCO Shaking Mechanism is unusually efficient; the upward and downward motion removes Dust that is hard to loosen. There is constant use of all effective cloth area for there are no frames or spacers to restrict flow of air. ALL THIS RESULTS IN LOW AIR RESISTANCE WHICH MAKES A SAVING IN FAN POWER. It will pay to find out what DRACCO Dust Control can do for you. With over 20 years experience to draw upon DRACCO Engineers are exceptionally well qualified to help you solve your particular problem.



Dracco Shaking Mechanism

DRACCO DUST COLLECTORS are maintained ON THE CLEAN AIR SIDE

WORKED ON FILTER NOT MAINTAINED ON CLEAN AIR SIDE

WORKED ON FILTER MAINTAINED ON CLEAN AIR SIDE

• Write for Bulletin No. 302 •

DRACCO CORPORATION

4077 E. 116th St., Cleveland, O. — New York Office, 130 W. 42nd St.

PNEUMATIC CONVEYORS • DUST COLLECTORS

• Quarry Truck

The Hug Co., Highland, Ill., has announced the addition of the Model 99S to its present line of quarry models. The Model 99S is built along the same lines as the Model 99, a very successful quarry unit.

The 99S is available with gasoline or Diesel power, has a maximum pay-load capacity of 40,000 to 44,000 lb. and is designed to handle power-hoist bodies up to 12 cu. yd. capacities.

The standard gasoline engine is the Buda GF-638 with the Cummins HB-6 Diesel offered as optional equipment. Transmissions include a 4-speed unit and 3-speed auxiliary, giving a total of 12 speeds forward and 3 in reverse.

The rear axle is the double reduction dual-

Quarry truck with 12-cu. yd. power-hoist body.

drive type, equipped with equalizing beams and torque rods properly to distribute the load over both axles and keep them in the same parallel plane. Tires are 12.75 by 20, single front and dual rear, with air brakes on all wheels.

Standard equipment also includes an all welded steel cab and the unit is offered with various types of side- and rear-dumping bodies and hoists.

• Motor Truck

The Model HG, newest of the FWD four-wheel-drive line of trucks, has just been announced by the Four Wheel Drive Auto Co. of Clintonville, Wis., and Kitchener, Ont.

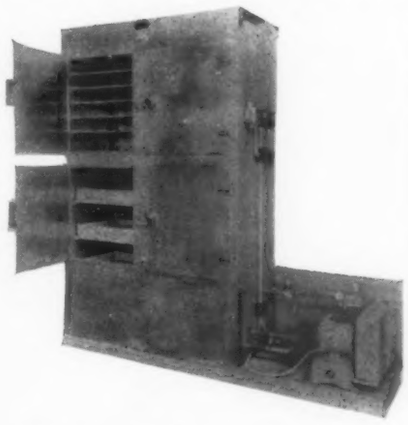
Attractively streamlined within the bounds of practicability, the new unit is of rugged construction, and built to withstand grueling operating conditions encountered in maintenance work.

Among the features is the construction of the patented FWD transfer case for this particular model. The case has been built

New four-wheel-drive truck.

so that a clearance of 23 in. under the driving mechanism permits the installation of an underbody scraper, or other underbody maintenance equipment.

The unit has a rated capacity of two tons, and a gross rating of 16,000 lb. The chassis weight (dry weight) is 6,530 lb. with cab included. A wheelbase of 156 in. is standard. With bore and stroke of 4⅛ in. by 4¼ in., and a piston displacement of 381 cu. in., the 6-cyl. FWD 6-MK motor developes 85 hp. at 2,500 r.p.m.



Moist closet for the storage and curing of cement test specimens is made by the Sodemann Heat & Power Co., St. Louis, Mo. It is being widely accepted by the cement industry for use in its laboratories.

• Pipe-Repair Clamp

Leaks in pipe-lines cause industry big losses every day in the year. The loss of the substance conveyed in the pipe line may be considerable, or its escape may be a hazard. But a still larger loss is the expense incident to pipe repair.

Many times when a leak occurs, a section of the pipe line must be shut off and taken out of service, and one or more lengths of pipe removed and replaced at considerable expense.

No one knows how great this toll is. Certainly it is tremendous, for practically every industry makes extensive use of pipe line for steam, water, oil, gas, air, etc., and a leak but the size of a pinhole can cause a lot of damage.

Engineers, superintendents and maintenance men who have been confronted with these conditions will welcome the new *Pipe Repair Handbook* published by M. B. Skinner Co., South Bend, Ind.

It discusses all the various kinds of leaks in pipe lines—holes, splits, pitted or corroded sections; and joints of various kinds such as threaded joints, bell-and-spigot joints, welded joints, collars, etc.

• Joist-Slab Machine

For years, concrete-products manufacturers had but one item for sale, the conventional concrete block. Recently, due to the promotion by the Portland Cement Assn. and architects, precast concrete slabs for floors and walls and precast concrete joists have come into use and a much wider market in the next year or so is predicted.

Anticipating this demand the R. & L.

MANGANESE STEEL CASTINGS

for—

· Pulverizers ·
· Conveyors ·
· Crushers ·
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· Shovels ·
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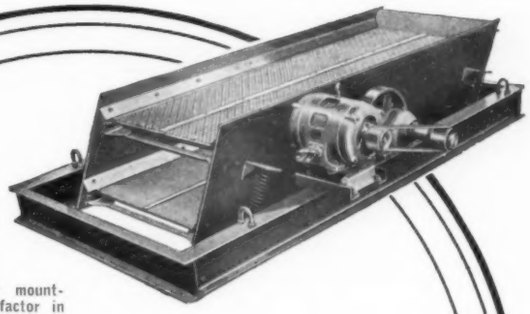
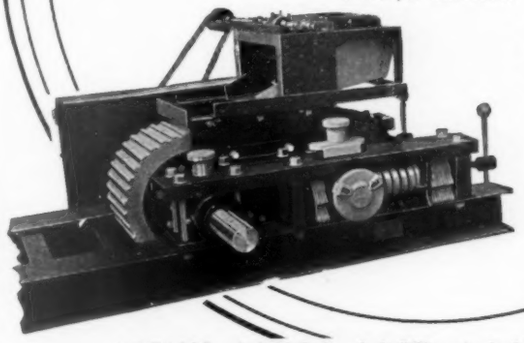
The Frog, Switch & Mfg. Co. CARLISLE, PA



CIRCLE THROW
Vibrating Screen for capacities to 100 tons per hour. Balanced for variations in loads and speeds. Rubber mountings—100% safety factor in rotary mechanism.

New Records with NEW HOLLAND

You can "keep going" with New Holland Screens and Crushers . . . they never "let you down." Sturdy construction, efficient lubrication and over-size bearings are factors in the economy and record production you get with New Holland equipment.
Write for Bulletins.



New Type Roll Crusher with improved pulsating feeder that doubles the capacity. Rib shell construction increases angle of grip.

NEW HOLLAND MACHINE CO.
New Holland, Penna.

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FIGHT COLD, ICE, FROST, SNOW WITH 2000°F HEAT

DOES WORK OF 5 MEN

FREE
Send for FREE Folder 150Q, tells how No. 99 Torch aids Maintenance Depts.

AEROIL No. 99 TORCH is portable, efficient, windproof and safe. Thaws frozen loading gates, chutes, hoppers, conveyors, tipples, pockets, tracks, interlocking devices, derails, scales, water, steam and oil pipes, etc. Used to keep piles of sand, gravel and coal free of frost. 10 DAYS FREE TRIAL. No. 99 Comes Complete with 4 Gal. Tank, 60 lb. gauge, Torch That Delivers 30, 2000°F Flame; and Shoulder Strap. (Burns Kerosene, Gasoline, Stove Oil). Price Complete, Only **$20**

AEROIL BURNER CO., INC.
WEST NEW YORK, N. J.
2021 So. Mich. Ave. Chicago — 3408 Main St. Dallas — 469 Bryant St. San Francisco

Concrete joists and pre-cast slabs may both be produced with this machine.

Concrete Machinery Co., Kendallville, Ind., is offering modern equipment for the production of these reinforced-concrete materials which should be of extreme interest to aggregate producers who are considering some such sideline as well as to established producers of concrete units.

The Crescent joist machine casts ten reinforced-concrete joists of standard I-beam design at one time. This design allows lightweight construction while maintaining maximum strength. Rubber stop blocks are provided for casting fractional sections of any desired length.

The same equipment can be used in the production of reinforced-concrete slabs for floors and walls.

The production of super-dense materials is assured by vibrating the concrete in the forms. The Crescent vibrator, firmly bolted beneath the machine, accomplishes what tamping, puddling and spading often failed to do with older equipment. Not only does vibrating produce a denser product with its resultant maximum strength and completely-filled voids, but the surface appearance of the finished product is strikingly improved—smooth, marble-like textures of remarkable uniformity always resulting.

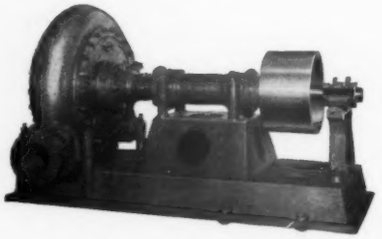
• Sand Pump

The most important and the most looked after parts of a sand pump are the main bearings and thrust collar.

The main bearings on the new 6-in. Lightning heavy-duty sand pump built by the Kansas City Hay Press Co. are composed of two unusually heavy double row annular ball bearings of tremendous load carrying capacity. These bearings take the load in every direction and require no attention other than an oil filling once or twice per year. These bearings are incased in an oil-tight housing of massive proportions and will last indefinitely with no sign of wear or fatigue.

Since these bearings are practically everlasting, the impeller is held to close limits in relation to the shell and consequently the efficiency is maintained. A large percentage of power is also saved.

The pump is equipped with special water-seal connections on the bearing side plate and the suction side plate which gives an even distribution of circulating water over the entire surface of the impeller adjacent to the front and back plate of the pump. This prevents sand from entering these two spaces and consequently greatly reduces wear on this most vital part of the sand pump.

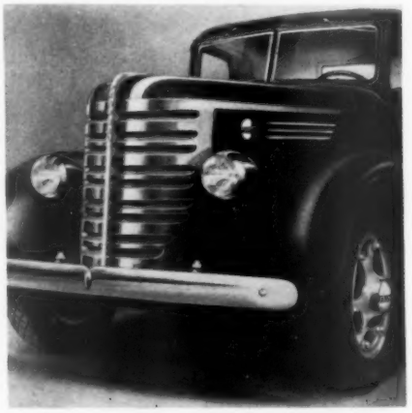


The heavy-duty sand pump.

• Motor Truck

Featuring new streamlining by Henry Dreyfuss, internationally famous industrial designer twelve new Federal truck models are being introduced for 1938 by the Federal Motor Truck Co. of Detroit.

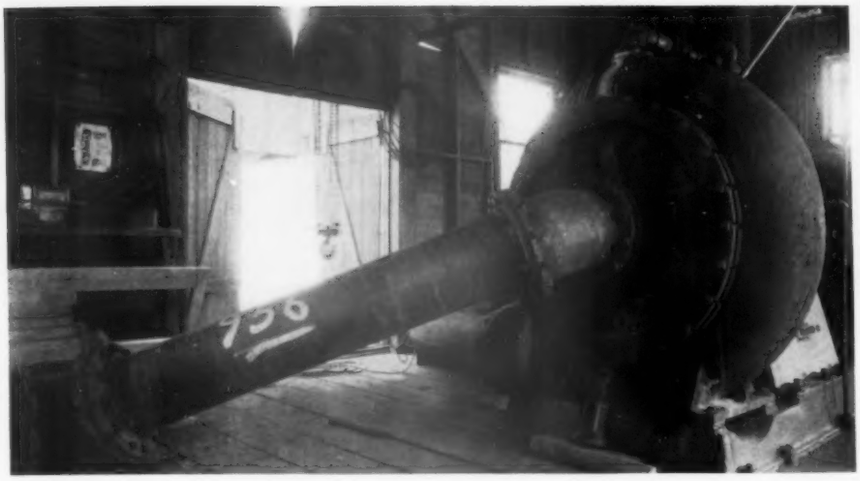
The new models, ranging from ¾-ton to 5-ton capacities, round out Federal's 1938 line of twenty-nine models including conventional and cab-over-engine types, which embrace virtually every commercial transportation requirement.



Front view of new 1938 model truck showing dynamic streamlining.

Front-end appearance of the new trucks is distinguished by a new type radiator grille from which the hood sweeps back to the streamlined cab. The dynamic exterior appearance is enhanced by the liberal use of chromium trim, employed on the hood louvres and windshield frames as well as the radiator grille, lamps and hub caps.

The new models are powered by a wide range of Hercules truck engines designed exclusively for commercial vehicle use. Features common to all 6-cyl. engines powering Federal trucks are 2½-in., seven-bearing



This length of 12-in. rubber-lined pipe was recently installed on the suction side of a Bennett centrifugal pump located on the dredge of the Rubber City Sand & Gravel Co., Akron, O. It is lined with 1/4-in. Armorite, a special abrasion-resisting rubber developed by the B. F. Goodrich Co., and replaces a similar length of Armorite line placed in service three years ago. When ordinary steel pipe was used at this position it had to be replaced, due to wear, on an average of three times per season.

crank-shafts with electrically-hardened bearing surfaces, large full-length water jackets, positive-gear-driven water pumps, force-feed lubrication, wide face, silent timing gears, air-cleaners, oil filters and governors. An oil bath air-cleaner is standard on all models with tonnage capacity of 2-3½-tons and upward.

Four-speed transmissions are standard on all models under 3-4½-ton capacity. Models of 3-4½-ton capacity and over have five-speed transmission. The latter equipment is optional on all models of 1½-2½-ton ratings and over.

Large four-wheel hydraulic brakes are standard equipment throughout the Federal line. All units of 2-3½-ton capacity and over are equipped with vacuum power boosters.

• Rock-Wool Hose

A new hose, designed especially for conveying rock wool, and other materials used for insulating buildings, has been announced by The Goodyear Tire & Rubber Co., Inc., of Akron, O.

A special feature of the new hose, known as Style 3535 Home Insulation—Rock Wool hose, is a wire reinforcement which prevents the hose from kinking or collapsing.

The cover of the hose is designed to resist abrasion, but will not mar or scratch the paint on sides of buildings where the hose is being used.

• Diesel Engines

As a further step in its program to make available a complete line of high-speed Diesel engines, paralleling in performance and installation dimensions Hercules gasoline engines of similar displacement, Hercules Motors Corp. has announced the series "DOO" 4-cyl. Diesels.

Of neat, compact design, the new series has been developed particularly for use in commercial vehicles of smaller and more popular sizes as well as for a wide variety of industrial applications. Three models of the new series have been produced, ranging from 56.5 to 70 h.p.

In general design the "DOO" series follows the principles employed in the larger model Diesel engines. The patented auxiliary combustion chamber, designed to insure complete combustion and control of fuel consumption, assures smooth, powerful, flexible and economical performance. This pre-combustion chamber, an entirely new development, is lo-

Although a great deal of brush and some stumps were present, stripping of a gravel deposit near Pawtucket, R. I. by J. J. McHale & Sons was rapidly and satisfactorily completed by this Le Tourneau Carryall scraper and Caterpillar tractor.

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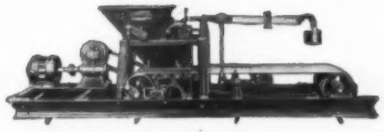

Weighing and proportioning material with 99% accuracy, Schaffer Poidometers are recognized throughout the cement industry as important equipment in modern plant control.

Schaffer Poidometers are automatic in action and will operate continuously or, with a mechanical weighmaster attachment, will provide batch operation.

This efficient weighing equipment is now saving thousands of dollars throughout the cement industry. Many leading plants are now saving money while obtaining greater efficiency with Schaffer Poidometers. Let us help solve your proportioning and feeding problems. *Write for catalog No. 5.*

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SCHAFFER POIDOMETERS

cated at the side of the cylinder bore. The "throat" which connects the cylinder with the chamber is so designed that the piston, on its approach to top center on the compression stroke, gradually reduces the throat area, thus automatically increasing the velocity of air entering this chamber at the time fuel is injected, insuring very thorough mixing of fuel and air.

A rigid crankshaft of ample proportions, with bearing surfaces electrically hardened by the Tocco process, is supported by five bearings in a crankcase which is cast integral with the cylinders. The crankcase also supports the four bearing camshaft. Aluminum-alloy pistons are used for maximum heat conductivity and lightness of reciprocating parts. Connecting rods are of heat-treated nickel chrome molybdenum steel, rifle drilled, providing pressure lubrication to the full-floating piston pins.

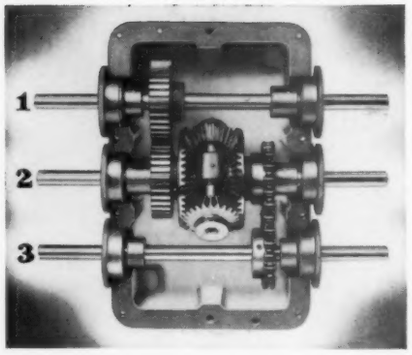
• Differential

Supplementing its line of accessory equipment for use with the Reeves variable-speed transmission, Reeves Pulley Co., Columbus, Ind., has developed a new differential.

This unit, known as model MDB-3, is similar in principle to the differential in a motor car. It is used for a variety of requirements in automatic speed control, such as synchronization of two or more machines or parts of a single machine, and maintenance of uniform peripheral winding or unwinding speeds.

Within a unit housing are mounted three parallel shafts operating in a bath of oil. Gears of 1:1 (stock) ratio drive between shaft 1 and the differential gearing. Between shaft 3 and the differential gearing is 1:1 chain drive. (Special ratios are also available).

For automatic control service, shafts 1 and 3 are connected to the driven machine or machines. Shaft 2 is connected to the speed changing screw of the Reeves transmission. When shafts 1 and 3 are driven in the same direction at the same speed, shaft 2 stands still. When the speed of the driven machine varies above or below desired speed, this variation is transmitted to shaft 2 which speeds up or slows down the transmission until synchronous speed is restored.



Differential for use with variable-speed transmission.

The differential may also be used as primary driving equipment for loads not exceeding its rated torque and speed capacity. For example, it may be used with other euipment to control index or register, either manually or with photo-electric equipment.

Infinite range of speed variation is possible by connecting shafts 1 and 3 to the constant and variable speed shafts, respectively, of the transmission By turning the speed control hand-wheel on the transmission, shaft 2 may be adjusted to any speed in either direction, including zero r.p.m.

Overall dimensions of the unit are 8 in. wide, 11 in. long and 6⅝ in. high. Shafts are extended on both sides so installation may be made as desired.

TRADE NOTES

A new firm of Whitehead-Comley, Inc. has been formed with main offices and plant located at 5600 Grays Ave., Philadelphia, Pa. Mr. Whitehead, president, is the Philadelphia distributor for the Owen Bucket Co., and owns and operates Maris Brothers, Inc., builder of traveling cranes. Mr. Comley was previously associated with the Equipment Corp. of America in its Philadelphia office. The new organization will handle the rental and sale of new and used construction equipment.

The Boston office of the Link-Belt Co. has been moved from the Statler Building to the Publisher's Building at 131 Clarendon St. In the new location, the office will occupy about 50 per cent. more space. The territory covered by the Boston office covers Maine, New Hampshire, Vermont, Massachusetts and Rhode Island. Frank Webster is district sales manager.

The Stulz-Sickles Co., Newark, N. J., has appointed as its distributor the Oliver H. Van Horn Co. Inc., New Orleans, La. with branches at Houston, Tex. and Shreveport, La.

A rather distinctive direct-mail piece presents for the first time in one publication Leeds & Northrup's unusual line of furnaces for heat-treating tools, dies and production parts. Every model, every size is covered—Vapocarb-Hump method equipment for hardening; Homo method equipment for tempering, annealing, normalizing and for nitriding. It may be obtained from the Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.

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CONVEYOR & ELEVATOR BELTS

Statement of Ownership

PIT AND QUARRY

Statement of the ownership, management, circulation, etc., required by the Act of Congress of March 3, 1933, of PIT AND QUARRY, published monthly at 538 S. Clark Street, Chicago, Ill., for October 1, 1936.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared S. A. Phillips, who, having been duly sworn according to law, deposes and says that he is the editor of PIT AND QUARRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Complete Service Publishing Co.; Editor, S. A. Phillips; Business Manager, H. W. Baumgartner, all of Chicago, Ill.

2. That the owner is Complete Service Publishing Co., Chicago, Ill. That the stockholders owning 1% or more of the total amount of stock are: H. W. Baumgartner, I. A. Baumgartner, S. A. Phillips and Evelyn W. Montgomery, all of Chicago, Ill.

3. That there are no bondholders, mortgagees, or other security holders owning or holding 1% or more of total amount of bonds, mortgages or other securities.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

S. A. PHILLIPS,
Editor.

Sworn to and subscribed before me this 30th day of September, 1937.

(Seal)

MICHAEL MOTTO,
Notary Public.

My commission expires Aug. 2, 1941.

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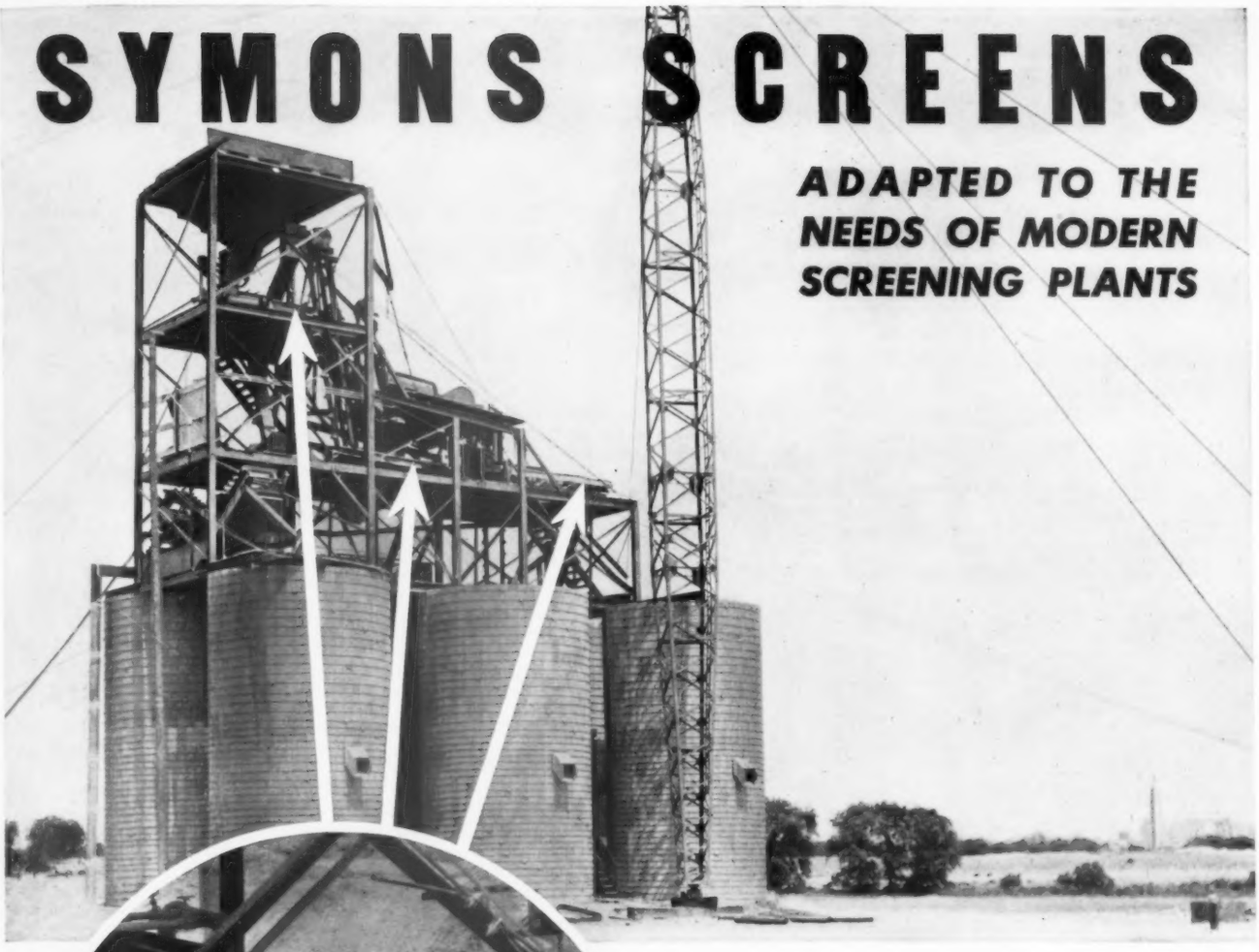
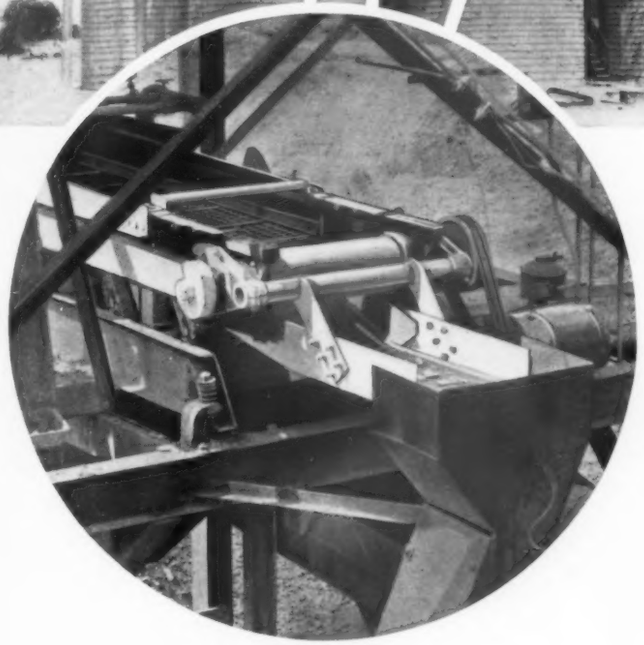
SYMONS SCREENS

ADAPTED TO THE NEEDS OF MODERN SCREENING PLANTS





In addition to the 3' x 8' double deck Symons Screen with vibrating discharge shown above, there are two more Symons Screens installed here—2' x 6' and 3' x 12', both double deck.

Many innovations in design and construction are to be found at the new gravel plant of the Crown Building Supply Company at Columbus, Ohio. In keeping with its modern features, three Symons Screens were chosen for the screening operations. With these flat screens, it is possible to secure the closer sized and better washed materials as are specified today, furthermore, being placed level, they materially reduce headroom, building height and construction costs. With a definite trend toward flat screening, Symons Screens have many advantages of interest to those contemplating a new plant or a modernization program.

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BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified.

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*Warren Brothers Roads Co.

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*Eagle Iron Works
Pettibone-Mulliken Corp.

Agitators, Thickeners and Slurry Mixers
*Hardinge Co.
*Traylor Engr. & Mfg. Co.

Air Compressors (Portable)
*Chicago Pneumatic Tool Co.
*Fuller Company
Gardner-Denver Co.

Air Compressors (Stationary)
*Chicago Pneumatic Tool Co.
Gardner-Denver Co.

Air Filters
*Blaw-Knox Co.
Dracco Corporation
*Parsons Engineering Corp.
*Sly Mfg. Co., W. W.
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Air Separators
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Frog Switch & Mfg. Co.
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Stulz-Sickles Co.
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*Link Belt Co.
Schaffer Poidometer Co.

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*Lima Locomotive Works, Inc.
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Taylor-Wharton Iron & Steel Co.
*Traylor Engr. & Mfg. Co.

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*Allis-Chalmers Mfg. Co.
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*Hardinge Co.
*Jeffrey Mfg. Co.
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Manganese Steel Forge Co.
*Traylor Engr. & Mfg. Co.

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*Link-Belt Co.
Robins Conveying Belt Co.
S-K-F Industries, Inc.
*Sprout, Waldron & Co.
Timken Roller Bearing Co.

Bearings (Ball)
S-K-F Industries, Inc.

Bearings (Roller)
S-K-F Industries, Inc.
Timken Roller Bearing Co.

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Flexible Steel Lacing Co.

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*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Republic Rubber Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

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*Sprout, Waldron & Co.

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*Ensign-Bickford Co.

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*Jeffrey Mfg. Co.

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*Sauerman Bros., Inc.
*Sprout, Waldron & Co.

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*Blaw-Knox Co.
Jaeger Machine Co.

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Borings, Core
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Pennsylvania Drilling Co.

Brick Machines (Concrete)
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Dunn Mfg. Co.

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*Harnischfeger Corp.
*Link-Belt Co.
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Taylor-Wharton Iron & Steel Co.
Wellman Engr. Co.

Buckets (Dump)
*Jaeger Machine Co.

Buckets (Dragline—Cableway)
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Bartlett & Snow Co., C. O.
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*Sprout, Waldron & Co.

Buggies (Dump)
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*Sprout, Waldron & Co.

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*Link-Belt Co.
Page Engineering Co.
*Roebling's Sons Co., John A.
*Sauerman Bros., Inc.

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*Link-Belt Co.
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Taylor-Wharton Iron & Steel Co.

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Chain Attachments
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*Jeffrey Mfg. Co.
*Link-Belt Co.

Chain (Elevating and Conveying)
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*Sprout, Waldron & Co.

Chute Lining (Rubber)
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Chutes and Chute Liners
American Manganese Steel Co.
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Haiss Mfg. Co., Geo.
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Manganese Steel Forge Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Classifiers
Bradley Pulverizer Co.
*Deister Machine Co.
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
*Nordberg Mfg. Co.
Simplicity Engr. Co.

Clips (Wire Rope)
*Leschen & Sons Rope Co., A.
*Roebling's Sons Co., John A.

Clutches
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Sprout, Waldron & Co.

Coal-Pulverizing Equipment
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
Bradley Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Compressors (See Air Compressors)

Concentrators (Slurry)
*Deister Concentrator Co.

Concrete Breakers (Air)
*Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Independent Pneu. Tool Co.

Concrete Mixers
*Blaw-Knox Co.
*Jaeger Machine Co.
*Koehring Co.

Concrete Products Plant Equipment
Universal Concrete Pipe Co.

Concrete Slab-Raising Equipment (Mud-Jacks)
*Koehring Co.

Condensers
*Chicago Pneumatic Tool Co.

Cones (Sand-Washing)
Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

* See also information in the 1937 Pit and Quarry HANDBOOK.

Our Type H Blake Jaw Crusher has also proved to be a humdinger. Bulletin 105 tells all!

week by week — more triumphs, for

TRAYLOR

TY REDUCTION CRUSHER

Steadily, the sales mount, of The Traylor Type TY Reduction Crusher — they've averaged about two per week during the nearly two years since its introduction.

Keeping pace, the chorus of approval from operators swells ever louder.

There's a reason — or, more correctly, many reasons. They're all set out in our Bulletin 3012. Send for your copy, now!

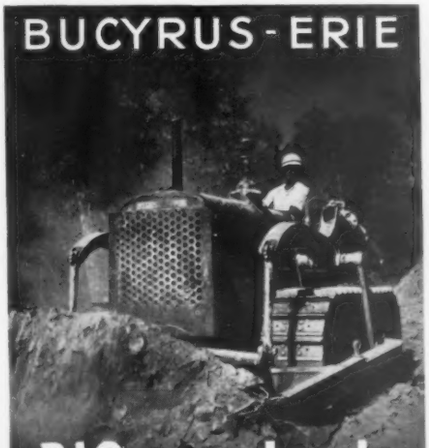
TRAYLOR ENGINEERING & MANUFACTURING CO.

ALLENTOWN, PENNSYLVANIA, U.S.A.

NEW YORK CITY 3916 Empire State Bldg.
CHICAGO 815 One La Salle St. Bldg.
SALT LAKE CITY 101 West Second South St.
LOS ANGELES 919 Chester Williams Bldg.
SEATTLE 6311 22nd Ave., N. E.
THE CANADIAN FAIRBANKS-MORSE CO., LTD. 980 St. Antoine St., Montreal, P. Q. Canada
B. C. EQUIPMENT CO. Vancouver, B. C. Canada
MAQUINARIA Isabel De Catolica 40. Mexico, D.F.
MANILA MACH. & SUPPLY CO. Manila and Baguio, P. I.

Export Department—104 Pearl St., New York City. Foreign Sales Agencies: London, Lima, Sao Paulo, Rio de Janeiro, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro
European Works—Usines Carels Freres, Ghent, Belgium

BUCYRUS-ERIE



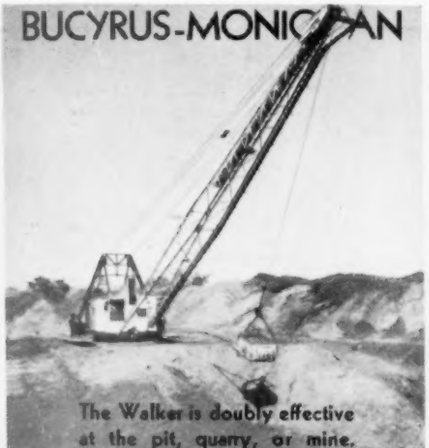
BIG pay loads

are assured with Bucyrus-Erie Bullgraders and Bulldozers. Fast blade travel with positive, hydraulic control increases work range, while balanced design makes full tractor power available to move big pay loads and cut dirt-moving costs. Write for bulletin.

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT... SOUTH MILWAUKEE, WISCONSIN, U.S.A.

BUCYRUS-MONIGHAN

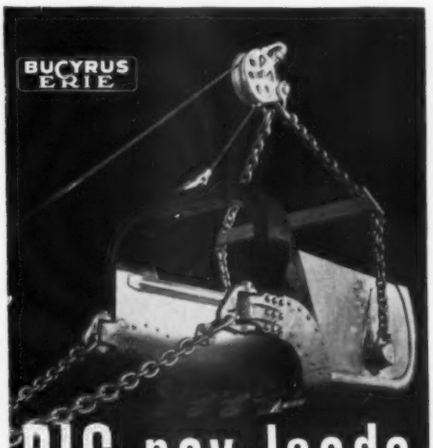


The Walker is doubly effective at the pit, quarry, or mine. When not turning in a big daily output at stripping, it holds the production spotlight in digging and loading coal or gravel. The Walker's exceptional output is possible because this fast-digging unit steps directly toward the desired location and saves time moving. Manufactured by Bucyrus-Monighan Co., Chicago, Illinois.

BUCYRUS MONIGHAN

Sold by
BUCYRUS-ERIE CO.
SOUTH MILWAUKEE, WISCONSIN, U.S.A.

BUCYRUS ERIE



BIG pay loads

RED ARCH dragline buckets are stronger, lighter, faster . . . designed to meet the heavy loads and increased speed demanded of modern excavating equipment. Red Arch buckets dig easily, dump cleanly and resist wear . . . they are the choice of operators who want the maximum in low-cost, high-output performance. Write for bulletins.

BUCYRUS-ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT... SOUTH MILWAUKEE, WISCONSIN, U.S.A.

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Conveyors and Elevators
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Bartlett & Snow Co., C. O.
Dracco Corporation
*Fuller Company
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Holmes & Bros., Inc., Robt.
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*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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*Link-Belt Co.
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Universal Crusher Co.

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*Link-Belt Co.
*Robins Conveying Belt Co.

Conveyors (Screw)
*Jeffrey Mfg. Co.

Conveyors (Vibrating)
*Jeffrey Mfg. Co.

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*Traylor Engr. & Mfg. Co.

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Independent Pneu. Tool Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

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*Chicago Pneumatic Tool Co.

Cranes (Crawler and Locomotive)
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
*Harnischfeger Corp.
*Koehring Co.
*Lima Locomotive Works, Inc.
*Link Belt Co.
Marion Steam Shovel Co.
Michigan Power Shovel Co.
Northwest Engr. Co.
Thew Shovel Co.

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*Harnischfeger Corp.

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*Harnischfeger Corp.

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Electric Steel Fdry Co.

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*American Pulverizer Co.
Bartlett & Snow Co., C. O.
Frog Switch & Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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Pettibone-Mulliken Corp.
Taylor-Wharton Iron & Steel Co.
*Traylor Engr. & Mfg. Co.

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*Nordberg Mfg. Co.

Crushers (Hammer)
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*American Pulverizer Co.
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Bradley Pulverizer Co.
Carnegie-Illinois Steel Corp.
*Dixie Machy. Mfg. Co.
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*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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*Williams Patent Crusher & Pulverizer Co.

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*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
New Holland Machine Co.
*Nordberg Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.
Universal Crusher Co.

Crushers (Ring)
*American Pulverizer Co.
Bartlett & Snow Co., C. O.
*Williams Patent Crusher & Pulverizer Co.

Crushers (Roll)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
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New Holland Machine Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

Crushers (Rotary)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
Bartlett & Snow Co., C. O.
New Holland Machine Co.
*Williams Patent Crusher & Pulverizer Co.

Crushing Rolls
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
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*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

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Frog Switch & Mfg. Co.
Pettibone-Mulliken Corp.
Taylor-Wharton Iron & Steel Co.

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*Bucyrus-Erie Co.
Frog Switch & Mfg. Co.
*Koehring Co.
Pettibone-Mulliken Corp.
Taylor-Wharton Iron & Steel Co.

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*Bucyrus-Erie Co.
*Link-Belt Co.
Page Engineering Co.
*Sauerman Bros., Inc.

Dragline Excavators
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
*Harnischfeger Corp.
*Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
Marion Steam Shovel Co.
Michigan Power Shovel Co.
Northwest Engr. Co.
Page Engineering Co.
Thew Shovel Co.

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*Bucyrus-Monighan Co.

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*Bucyrus-Erie Co.
Hetherington & Berner, Inc.
*Morris Machine Works

Drill Bits
*Chicago Pneumatic Tool Co.

Drill Sharpening Machines
Gardner-Denver Co.

Drilling Accessories
*Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Independent Pneu. Tool Co.
Timken Roller Bearing Co.

Drilling Contractors
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
*Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Independent Pneu. Tool Co.

Drills (Core)
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Diamond)
*Chicago Pneumatic Tool Co.
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Hand-Hammer)
*Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Independent Pneu. Tool Co.

Drills (Rock)
*Chicago Pneumatic Tool Co.
Gardner-Denver Co.
*Jeffrey Mfg. Co.

Drill Steel
*Chicago Pneumatic Tool Co.
Independent Pneu. Tool Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple, Belt, Chain, Rope)
*Allis-Chalmers Mfg. Co.

Dryers
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mch. Co.
McLanahan and Stone Corp.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Dust Arresters
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corporation
*Parsons Engineering Corp.
*Sly Mfg. Co., W. W.
*Western Precipitation Corp.

Dust Collecting Systems
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*Blaw-Knox Co.
Dracco Corporation
*Parsons Engineering Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Sly Mfg. Co., W. W.
*Western Precipitation Corp.

Dust Conveying Systems
Allen-Sherman-Hoff Co.
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corporation
*Fuller Company
*Parsons Engineering Corp.
*Sly Mfg. Co., W. W.
*Western Precipitation Corp

Dust Filters
*Parsons Engineering Corp.
*Sly Mfg. Co., W. W.
*Western Precipitation Corp

Dust Handling Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

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Electrical Equipment
*Allis-Chalmers Mfg. Co.

Electrodes (Welding)
Stulz-Sickles Co.

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Engineers
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Bradley Pulverizer Co.
*Fuller Company
Hetherington & Berner, Inc.
Holmes & Bros., Inc., Robt.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.
Sturtevant Mill Co.
*Traylor Engr. & Mfg. Co.

Engine Generator Sets
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Engines (Diesel)
Caterpillar Tractor Co.
*Chicago Pneumatic Tool Co.
*Cooper-Bessemer Corp.
National Supply Co. of Delaware
*Nordberg Mfg. Co.
Page Engineering Co.

Engines (Internal-Combustion)
Caterpillar Tractor Co.
*Chicago Pneumatic Tool Co.
*Cooper-Bessemer Corp.
National Supply Co. of Delaware
*Nordberg Mfg. Co.
Page Engineering Co.

Engines (Steam)
*Morris Machine Works
*Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets, etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
Haiss Mfg. Co., Geo.

Fabricating (Electric Arc and Oxy-Acetylene)
Smith Co., S. Morgan
Stulz-Sickles Co.

Fans (Exhaust)
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
Bradley Pulverizer Co.
*Fuller Company
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.
Universal Crusher Co.

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Forges (Oil)
Gardner-Denver Co.

Fuses (Detonating)
*Ensign-Bickford Co.

Gaskets
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.

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Gas Producers
Wellman Engr. Co.

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
Haiss Mfg. Co., Geo.
*Link-Belt Co.

Gears (Herringbone)
Bartlett & Snow Co., C. O.

*** See also information in the 1937 Pit and Quarry HANDBOOK.**

WILLIAMS HAMMER CRUSHERS STAND FIRST IN BETTER STONE CRUSHING

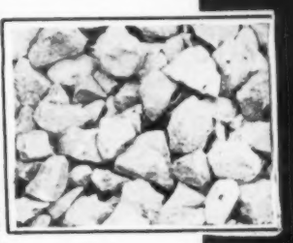
Crush 36 in. Rock to 1¼ in. in One Operation

With One Williams Crusher—Saving in Investment of 50% to 75%

(A Size Crusher for every job
Capacities 3 to 300 tons per hour)

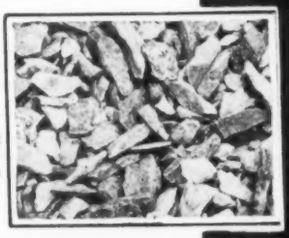
Power Shovel loaded rock reduced to commercial size in *one operation* with one Williams Crusher. Saves much sledging and avoids secondary blasting—Saves by use of smaller buildings, fewer foundations, conveyors, drives and motors. Write for literature

CUTAWAY VIEW
of a Williams "Jumbo Junior" Crusher, Showing Hammers and Sizing Grates.



A Williams Crushed Product
(Actual Photo)
Note the cubular form of Product with no slivers and slabs.

Both samples taken from the same quarry



Ordinary Crushed Product
(Actual Photo)
Note slivers and slabs not crushed by a Williams crusher.

Williams Patent Crusher & Pulverizer Company
802 St. Louis Ave., St. Louis, Mo.

CHICAGO 37 W. Van Buren St. — *Sales Agencies* — NEW YORK, 15 Park Row — SAN FRANCISCO 326 Rialto Bldg.

WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS U.S.A. TRADE MARK REG. U.S. PAT. OFF.

WILLIAMS

OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

PATENT CRUSHERS GRINDERS SHREDDERS

DRAG LINE ON WHEELS

Serving scattered jobs from scattered sources of supply called for this high-speed MICHIGAN TRUCK DRAGLINE, which has reduced unproductive time between locations, and is loading more trucks per day. Besides cutting operating costs, this MICHIGAN has increased operator efficiency by eliminating fatigue... MICHIGAN Accessory Equipment gives owners several machines in one--DRAGLINE, SHOVEL, CRANE, CLAM and TRENCH-HOE-at minimum cost!

MAKE YOUR SMALL JOBS PAY AND YOUR BIG JOBS PAY MORE

MICHIGAN POWER SHOVEL CO. Benton Harbor, Mich.

Write for Bulletin "P"

BUYERS' GUIDE

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*Link-Belt Co.
*Sprout, Waldron & Co.

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*Sprout, Waldron & Co.

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*Hendrick Mfg. Co.

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Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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Manganese Steel Forge Co.
Pettibone-Mulliken Corp.
*Robins Conveying Belt Co.
Smith Engr. Works

Guards (Wire)
Bartlett & Snow Co., C. O.
Manganese Steel Forge Co.
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Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

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Hoists
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*Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Hetherington & Berner, Inc.
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*Jaeger Machine Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
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American Manganese Steel Co.
Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.

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*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

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*Hardinge Co.

Lime-Handling Equipment
Bartlett & Snow Co., C. O.
*Fuller Company
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Robins Conveying Belt Co.

Lime and Hydrating Plants
*Hardinge Co.
Traylor Engr. & Mfg. Co.

Lime Kilns
Bartlett & Snow Co., C. O.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

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Hummel-Foley Corp.

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Loaders and Unloaders
Bartlett & Snow Co., C. O.
*Bucyrus-Erie Co.
*Fuller Company
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Locomotives (Diesel)
*Whitcomb Locomotive Co.

Locomotives (Diesel-Electric)
*Whitcomb Locomotive Co.

Locomotives (Electric, Gas, Steam)
*Lima Locomotive Works, Inc.
*Whitcomb Locomotive Co.

Locomotives (Gas-Electric)
*Whitcomb Locomotive Co.

Locomotives (Oil-Electric)
*Whitcomb Locomotive Co.

Locomotives (Storage Battery)
*Jeffrey Mfg. Co.

Locomotives (Trolley-Battery)
*Jeffrey Mfg. Co.

Magnetic Pulleys (See Pulleys, Magnetic)

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American Manganese Steel Co.
Frog Switch & Mfg. Co.
Manganese Steel Forge Co.
Pettibone-Mulliken Corp.

Manganese Steel Castings
American Manganese Steel Co.
Frog Switch & Mfg. Co.
Pettibone-Mulliken Corp.
Taylor-Wharton Iron & Steel Co.

Manganese Steel (Plates and Sheets)
American Manganese Steel Co.
Manganese Steel Forge Co.
Taylor-Wharton Iron & Steel Co.

Mechanical Rubber Goods
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Mill Liners and Linings
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
Carnegie-Illinois Steel Corp.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

Mills (Ball, Tube, etc.)
*Allis-Chalmers Mfg. Co.
*Hardinge Co.
*Traylor Engr. & Mfg. Co.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
Bartlett & Snow Co., C. O.
Bradley Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mch. Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

Motors and Generators
*Allis-Chalmers Mfg. Co.
*Harnischfeger Corp.

Motors (Internal-Combustion) (See Engines — Internal-Combustion)

Netting (Locomotive Stack)
*Tyler Co., W. S.

Nozzles (Gravel Washing)
*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Deister Concentrator Co.

Packings
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Partitions (Wire)
National Wire Cloth Co.

Paving Mixers
*Jaeger Machine Co.
*Koehring Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Sprout, Waldron & Co.
*Wickwire Spencer Steel Co.

Pipe, Dredge (Floating and Shore)
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Forms (Concrete)
Universal Concrete Pipe Co.

Pipe Machines (Concrete)
Universal Concrete Pipe Co.

Pipe (Spiral)
Naylor Pipe Co.
Taylor Forge & Pipe Co.

Pipe (Welded)
Naylor Pipe Co.
Taylor Forge & Pipe Co.

Plants (Aggremeter) (See Aggremeter Plants)

Plug Valves (See Valves)

Pneumatic Conveying Systems (See Conveyors—Pneumatic)

Pneumatic Drills (See Drills, Rock)

Poidometers
Schaffer Poidometer Co.

Portable Conveyors
*Fuller Company
Haiss Mfg. Co., Geo.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Portable Crushing and Screening Plants
Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Power Shovels (See Shovels, Electric, Internal-Combustion and Steam)

Precipitators
*Western Precipitation Corp.

Pre-formed Wire Rope
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of the American Chain & Cable Co.
*Leschen & Sons Rope Co., A.

Proportioning Equipment
*Blaw-Knox Co.
*Jaeger Machine Co.
Schaffer Poidometer Co.

Pulleys
Sprout, Waldron & Co.

Pulleys (Magnetic)
*Sprout, Waldron & Co.

Pulleys (Wing)
*Sprout, Waldron & Co.

Pulverized Fuel Systems
Bartlett & Snow Co., C. O.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.

Pulverizers (See also Crushers, Mills, etc.)
*American Pulverizer Co.
Bartlett & Snow Co., C. O.
Bradley Pulverizer Co.
*Gruendler Crusher & Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
New Holland Machine Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
Sturtevant Mill Co.
Traylor Engr. & Mfg. Co.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

Pump Parts
Pettibone-Mulliken Corp.
Taylor-Wharton Iron & Steel Co.

Pump Valves (See Valves, Pump)

Pumps (Air-Lift)
*Chicago Pneumatic Tool Co.
*Fuller Company
*Ingersoll-Rand Co.

Pumps (Bulk Cement)
*Fuller Company

Pumps (Cement Slurry)
Allen-Sherman-Hoff Co.
*Morris Machine Works

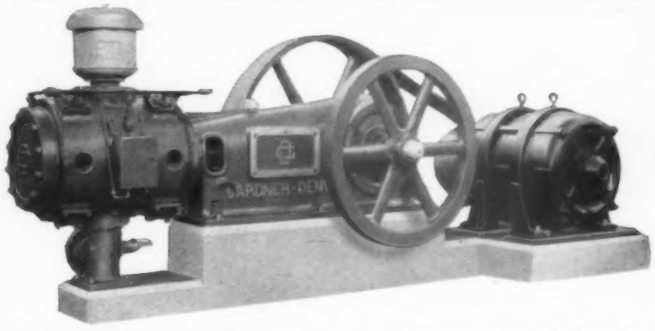
Pumps (Centrifugal)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
Independent Pneu. Tool Co.
*Jaeger Machine Co.
Kansas City Hay Press Co.
*Morris Machine Works
Pettibone-Mulliken Corp.

Pumps (Dredging)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bucyrus-Erie Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
*Morris Machine Works
Pettibone-Mulliken Corp.

Pumps (Sand and Gravel)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.

* See also information in the 1937 Pit and Quarry HANDBOOK.

A Forward Step IN PERFORMANCE AND QUALITY FOR PITS AND QUARRIES



Whether your job is that of increasing production or lowering costs, Gardner-Denver RX Compressors assure you adequate air supply *with* air economy. Here's why:

- Uninterrupted air supply.
- Electro-pneumatic control—adjusts power consumption to air demands.
- Roller Bearings—assure practically vibrationless operation.
- Dustproof, completely enclosed design—with no sacrifice of accessibility.
- Accurate balance and freedom from vibration.
- Higher output and lower power costs.

Gardner-Denver RX Compressors are made in four sizes—to fit *your* needs.

Write us for complete information.

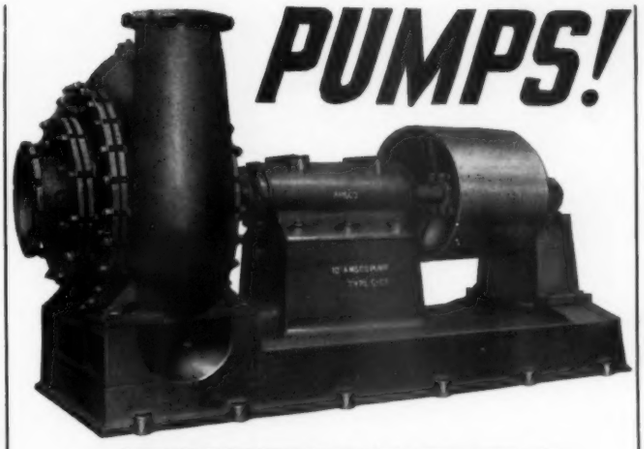
GARDNER-DENVER COMPANY

Quincy, Illinois

Since 1859

GARDNER-DENVER

PUMPS!



FITTINGS!

CUTTERHEADS!

You profit most when a single source of supply with undivided responsibility furnishes the pump, the flap valves, pipe fittings and dredge cutter heads. Such a complete service is provided by AMSCO for sand and gravel producers and dredge operators—a service that further offers competent suggestions on design and construction of dredges, ladders, piping and other major and minor operating equipments. AMSCO Manganese Steel pumps, fittings and cutter heads are made in many types and sizes to cope with varying operating conditions—each unit providing longest and most satisfactory service because AMSCO designs are service-proved and made of AMSCO Manganese Steel, "the toughest steel known." Send for a copy of the new AMSCO Pump and Accessory Bulletin recently published!

AMSCO

AMERICAN MANGANESE STEEL DIVISION

of The American Brake Shoe & Foundry Company

396 East 14th Street, Chicago Heights, Ill.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., St. Louis, Mo., Oakland, Calif., Los Angeles, Calif.

Offices in Principal Cities

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Erie Pump & Engine Works
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
*Morris Machine Works
Pettibone-Mulliken Corp.

Pumps (Sump)
*Chicago Pneumatic Tool Co.

Pumps (Vacuum)
*Chicago Pneumatic Tool Co.
*Fuller Company

Ready-Mixed Concrete Plants
Bartlett & Snow Co., C. O.
*Jaeger Machine Co.

Rock Drills (See Drills—Rock)

Rod Mills
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

Rods (Welding)
American Manganese Steel Co.
Stulz-Sickles Co.
Taylor-Wharton Iron & Steel Co.

Rope (Wire) (See Wire Rope)

Sand and Gravel Handling Equipment
*Jeffrey Mfg. Co.
*Link-Belt Co.

Sand Separators
Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
Simplicity Engr. Co.
Smith Engr. Works

Sand—Lime—Brick Machinery
*Hardinge Co.

Sand-Settling Tanks
Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Nordberg Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works

Scales
Howe Scale Co.
Merrick Scale Mfg. Co.

Scales (Track or Truck)
Howe Scale Co.
Merrick Scale Mfg. Co.

Scrapers (Power Drag)
Iowa Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
*Sauerman Bros., Inc.

Screens
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bacon, Inc., Earle C.
Bartlett & Snow Co., C. O.
Carnegie-Illinois Steel Corp.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
Ludlow-Saylor Wire Co.
Manganese Steel Forge Co.
McLanahan and Stone Corp.
National Wire Cloth Co.
*Nordberg Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Simplicity Engr. Co.
Smith Engr. Works
*Sprout, Waldron & Co.
Sturtevant Mill Co.
Taylor-Wharton Iron & Steel Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.
Universal Crusher Co.

Screens (Vibrating or Shaking)
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
*Deister Concentrator Co.
*Deister Machine Co.
*Gruendler Crusher & Pulverizer Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Nordberg Mfg. Co.
*Pioneer Gravel Equipment Mfg. Co.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
Smith Engr. Works
*Sprout, Waldron & Co.
Sturtevant Mill Co.
*Tyler Co., W. S.
Universal Crusher Co.
*Williams Patent Crusher & Pulverizer Co.

Scrubbers
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Separators (Air) (See Air Separators)

Separators (Magnetic)
Exolon Co.

Sheaves
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Link-Belt Co.
*Jeffrey Mfg. Co.
McLanahan and Stone Corp.
Pettibone-Mulliken Corp.
*Sprout, Waldron & Co.

Shovels (Electric, Internal-Combustion and Steam)
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
*Harnischfeger Corp.
*Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
Marion Steam Shovel Co.
Michigan Power Shovel Co.
Northwest Engr. Co.

Skip Hoists and Skips
*Allis Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Sleeves Dredge
*Cincinnati Rubber Mfg. Co.

Speed Reduction Units
Iowa Mfg. Co.
*Link-Belt Co.

Spirals (Lowering)
Holmes & Bros., Inc., Robt.

Spouts (See Chutes and Chute Liners)

Sprays
*Deister Concentrator Co.

Sprockets and Chain
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Pettibone-Mulliken Corp.
*Sprout, Waldron & Co.

Stackers
*Jeffrey Mfg. Co.

Steel (Alloy)
(See Alloys—Steel)

Steel Grating (See Grating, Steel)

Steel Plate Construction
Hetherington & Berner, Inc.
Holmes & Bros., Inc., Robt.
Manganese Steel Forge Co.
*Sprout, Waldron & Co.
Taylor-Wharton Iron & Steel Co.

Stone Grapples
Owen Bucket Co.

Storage Equipment
Bartlett & Snow Co., C. O.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Sauerman Bros., Inc.

Surfacers (Concrete)
Independent Pneu. Tool Co.

Sweeping Systems
Allen-Sherman-Hoff Co.

Tanks
Bartlett & Snow Co., C. O.
*Chicago Bridge and Iron Co.
*Hendrick Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
*Traylor Engr. & Mfg. Co.

Tanks (Sand-Settling)
Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works

Testing Sieves and Shakers
*Hendrick Mfg. Co.
*Tyler Co., W. S.

Thawing Equipment
Aeroil Burner Co.

Thickeners (Slurry)
*Hardinge Co.

Tire Repair Materials
Goodyear Tire & Rubber Co.

Tools (Drill) (See Drilling Accessories)

Torches (Thawing)
Aeroil Burner Co.

Track and Track Materials
Taylor-Wharton Iron & Steel Co.

Track Equipment
Pettibone-Mulliken Corp.

Track Shifters
*Nordberg Mfg. Co.

Tractors
*Allis-Chalmers Mfg. Co.
Caterpillar Tractor Co.

Tramways (Aerial)
*Roebling's Sons Co., John A.

Transformers
*Allis-Chalmers Mfg. Co.

Transmission Belting (See Belting)

Transmission Machinery
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Trippers
Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Truck Cranes (See Cranes)

Truck Mixers
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
*Jaeger Machine Co.

Trucks (Hand)
Howe Scale Co.

Trucks and Trailers (See Motor Trucks)

Tube-Mills (See Mills—Ball, Tube, etc.)

Tubes (For Tire Casings)
Goodyear Tire & Rubber Co.

Turbines
Smith Co., S. Morgan

Underground Loaders
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.

Unloaders (Box Car)
Bartlett & Snow Co., C. O.
*Fuller Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Valves (Pump)
*Cincinnati Rubber Mfg. Co.
Taylor Forge & Pipe Works

Variable Speed Reducers or Transmissions
*Link-Belt Co.

Vibrating Screen Plate
Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Vibrating Screens (See Screens—Vibrating)

Vibrators
Independent Pneu. Tool Co.
*Jeffrey Mfg. Co.
*Tyler Co., W. S.

Wagons (Dump)
*Koehring Co.
LeTourneau, Inc., R. G.

Washers (Sand, Gravel and Stone)
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
*Eagle Iron Works
Haiss Mfg. Co., Geo.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Mach. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equipment Mfg. Co.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.
Universal Crusher Co.

Weighing Equipment (Automatic)
*Blaw-Knox Co.
*Fuller Co.
Howe Scale Co.
*Jaeger Machine Co.
Merrick Scale Mfg. Co.
Schaffer Poidometer Co.

Welding Bars, Wedge and Applicator (Nickel - Manganese Steel)
Stulz-Sickles Co.

Welding and Cutting Equipment
Smith Company, S. Morgan
Stulz-Sickles Co.

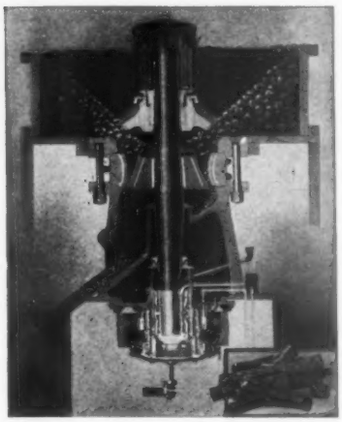
Welding Rods
American Manganese Steel Co.
Bradley Pulverizer Co.
Stulz-Sickles Co.

Welding Service
Smith Co., S. Morgan
Stulz-Sickles Co.

Welding Supplies
American Manganese Steel Co.
*Harnischfeger Corp.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.
Stulz-Sickles Co.
Taylor-Wharton Iron & Steel Co.

Well Drills (See Drills—Well)

*See also information in the 1937 Pit and Quarry HANDBOOK.



GREATER TONNAGE with HALF THE POWER COST Guaranteed

THE Kennedy Ball Bearing Gearless Gyratory Crusher is guaranteed to produce a greater tonnage than any other crusher of a given size, with half the power per ton of ore. This crusher can be equipped with a synchronous motor in its pulley, or driven by flat or V-belt from a standard motor.

The Savings Effected with this crusher are astounding:

In cost of Maintenance 80%
In Power ..... The entire cost of crusher and motor in pulley is amortized annually.

Sieving test on glacial gravel crushed at the rate of 18 tons per hour, with No. 19 crusher set to ⅛ in., and using less than 25 hp., follows:

Minus ⅜ in.	100%
Plus 3 mesh	21½%
Minus 3—Plus 4	17%
Minus 4—Plus 14	36½%
Minus 14—Plus 48	15%
Minus 48—Plus 100	4%
Minus 100	5½%

KENNEDY VIBRATING SCREEN

Built in open or enclosed types, in widths ranging from 3′ to 6′ with one or more decks. It can be suspended, or supported from the bottom.

Suitable for scalping oversize from primary crushers, as well as smaller sizes, and chemical products.

The entire screening surface is effective, thereby insuring greatest capacity.

Equipped with self-aligning main bearings which account for low power consumption and also for long life of bearings.

Screen drive shaft is positioned near the feed end for balancing purposes and is patented.

Write for One of Our Engineers to Call

KENNEDY-VAN SAUN MFG. & ENG. CORP.

2 Park Avenue **New York, N. Y.**

Sales Agents in all Principal Cities of the United States.

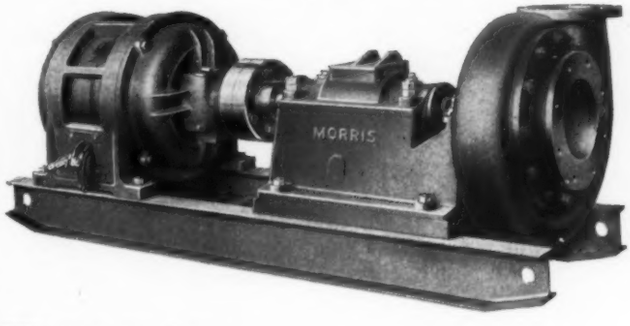
The MORRIS HYDRAULIC COLUMN

News of interest to Centrifugal Pump Users

Astronomical tonnages

at microscopic costs . . . .

We once wrote to a number of customers to ask about performance records of their Morris Dredges. The result left us rather dizzy from the tremendous production figures and the tiny cost figures. Many of the dredges had each handled over a million cu. yds. of highly abrasive material without requiring any renewals. We learned of instances where sand and gravel were pumped, washed, sorted, and stocked in piles within 3 minutes after entering the dredge suction lines; where production was twice as high as expected; and where dredges had been used on upwards of four or more different jobs. Users told us of fuel costs less than ½ cent per ton of material handled, total production costs less than 10 cents per cu. yd., and renewal costs less than $10 per year over a long period. No wonder so many users of Morris Dredges refuse to consider any other make! Morris Dredge Bulletins contain many interesting performance references. A post card will bring you a copy by return mail.



What a sucker . . . .

An outstanding feature of this Morris Single Suction Pump is its ability to operate successfully on unusually high suction lifts. Even when this pump is 28 or 30 feet above the supply surface, it will hold its suction and deliver rated capacity continuously—of course, provided the water is cold. This unit could well be called our "omnibus" pump—it is adapted to so many purposes in sand and gravel plants, cement mills, for contracting work, etc. You will find it fully described in Bulletin 165—copy on request.

For authoritative recommendations on any pumping or dredging problem, write to Morris Machine Works, Baldwinsville, N. Y. Representatives in Principal Cities

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A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Wheels (Car)
American Manganese Steel Co.
*Eagle Iron Works
Iowa Mfg. Co.
Pettibone-Mulliken Corp.

Wheel Rims. See Rims—Wheel

Winches and Capstans
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Wire and Cable (Electric)
*Roebling's Sons Co., John A.

Wire Cloth
Cleveland Wire Cloth & Mfg Co.
Ludlow-Saylor Wire Co.
Manganese Steel Forge Co.
National Wire Cloth Co.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Taylor-Wharton Iron & Steel Co.
Tyler Co., W. S.

Wire Rope
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of the American Chain & Cable Co., Inc.
*Leschen & Sons Rope Co., A.
*Roebling's Sons Co., John A.
Union Wire Rope Co.

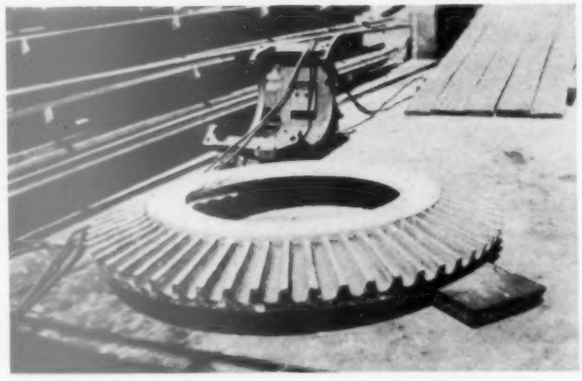
Wire Rope Fittings
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of the American Chain & Cable Co., Inc.
*Leschen & Sons Wire Rope Co., A.
Page Eng. Co.
*Roebling's Sons Co., John A.
Union Wire Rope Co.

Wire Rope Slings
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of the American Chain & Cable Co., Inc.
*Leschen & Sons Rope Co., A.
*Roebling's Sons Co., John A.
Union Wire Rope Co.

Wire (Welding)
American Manganese Steel Co.
Manganese Steel Forge Co.
*Roebling's Sons Co., John A.

Worm Gears (See Gears and Pinions)

* See also information in the 1937 Pit and Quarry HANDBOOK.



Use the Manganal method for repairing pump shells, dipper teeth and similar equipment.

MANGANAL

Nickel Manganese Steel Reg. U. S. Patent Office Nos. 1,876,738, 1,947,167 and 2,021,945

Saved This Ring Gear

Worn portions were rebuilt with Manganal Welding Electrodes to their normal size, changing the carbon steel surface to manganese steel, greatly increasing resistance to wear. Manganal Applicator Bars are the ideal method of replacing metal—quick, economical and durable. Use Seaco Hard Surfacing Electrodes for overlay welding.

Write for Bulletins

STULZ-SICKLES CO., 134-142 LaFayette St.
Newark, New Jersey

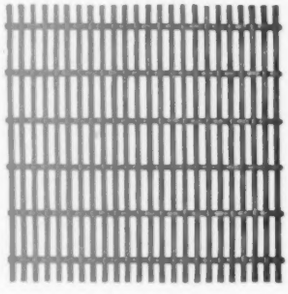
The Owen Grapple, unlike anything heretofore developed, has independently operating tines which grasp an object firmly regardless of its shape.

To "grapple the Owen way" assures a safer operation with a bigger load at every grab and more grabs per day.

Get special illustrated bulletin.

The OWEN BUCKET Co., 6050 Breakwater Avenue, Cleveland, Ohio

Branches: NEW YORK PHILADELPHIA CHICAGO BERKELEY, CAL.



Rolled Slot

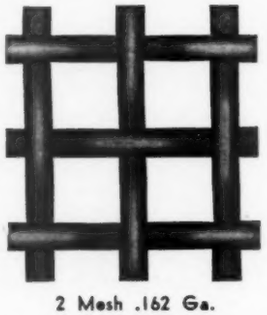
ALLOY No. 2

A super wearing Steel developed to resist the abrasion and vibration of modern screening demands.

"CLEVELAND" SCREENS

A wire cloth of guaranteed accuracy backed by fine workmanship and an effort to satisfy.

Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.

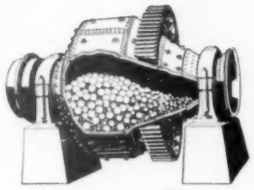


2 Mesh .162 Ga.

THE CLEVELAND WIRE CLOTH & MFG. COMPANY
574 E. 78th St. CLEVELAND, OHIO

Grinding

WET DRY



HARDINGE
CONICAL MILL

THE CONICAL MILL is ideal, when operated in open circuit, where a granular product of ten to twenty mesh is desired.

For a finer product, ground wet, the Mill should be operated in closed circuit with a Hardinge Counter Current Classifier. This combination produces a uniformly fine product, whether 28 or as fine as 325 mesh, and no material leaves the circuit until it is properly ground.

THE HARDINGE Superfine Air Classifier attached to the Conical Mill, for fine dry grinding, delivers a product that surpasses in uniformity that produced by any of the older methods.

The cost of grinding is less because the grinding media works only on unfinished material. The air removes the ground material as quickly as it is produced—and the unit is free from dust as it operates under a partial vacuum.

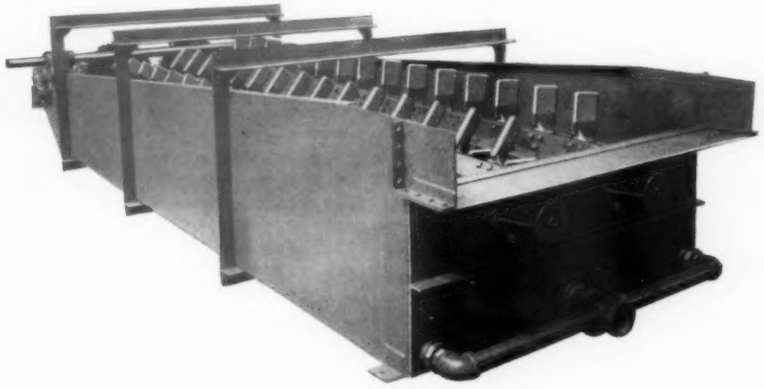
HARDINGE COMPANY *INCORPORATED*

YORK, PENNSYLVANIA, *Main Office and Works*

NEW YORK, 122 E. 42nd St. CHICAGO, 205 W. Wacker Drive SAN FRANCISCO, 501 Howard St. DENVER, 817 17th St.

In no other washer can all these features be found . . . . . .

RUGGEDNESS, dependability, efficiency and ability to handle large production at lowest cost.



The EAGLE Paddle Type Log Washer, through the greater action of the paddles, has been found extremely effective for breaking down and removing those difficult tough clays and cemented aggregates found in some gravels. No job of material washing is too tough for EAGLE WASHERS.

These paddle type machines subject the material to the same washing action which has proved so successful in our screw type.

Deposits formerly considered unprofitable have been turned into profit producers. Our engineers are specialists in all material washing problems. We invite your inquiries without obligation on your part.

EAGLE IRON WORKS

DES MOINES, IOWA

Scraper operation successful in iron ore

LOWERS COSTS

As pits deepen in the Mesabi iron range of Minnesota, the time-honored method of shovels for loading and steam trains for hauling ore shows rising costs. Consequently, many pits are faced with the necessity for lower cost hauling or have been abandoned as unprofitable.

When engineers proposed to eliminate the long, spiraling tracks, or switch-backs, by using conveyor systems, they called on LeTourneau field engineers to help them work out a method of feeding ore to the conveyors. After going over several pits, LeTourneau field engineers decided LeTourneau Rooters could rip the virgin ore. Then Carryall Scrapers would pick up the ore and carry it to hoppers for conveyor delivery to shipping points. This method would, in many places, do away with necessity for shooting and shovel loading.

The LeTourneau U-12 Carryall, Rooter and Bulldozer have proved successful after extensive and varied field tests, thus providing means for lower operating costs. Here is a report of typical performance in unshot iron ore:

Round trip haul	1150 feet
Round trip average time	5.12 minutes
Number of trips	52
Long tons per trip	18+
Average delivery per hour	211 long tons

A one man operation—A big tonnage delivery—A new low cost!

Ask our Field Engineering Department how LeTourneau equipment can provide a low cost solution to your material-handling problems.

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Peoria, Illinois .·. Stockton, California

Cable Address: "Bobletorno"

MANUFACTURERS OF: Angledozers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Treedozers.

*Name registered U. S. Patent Office

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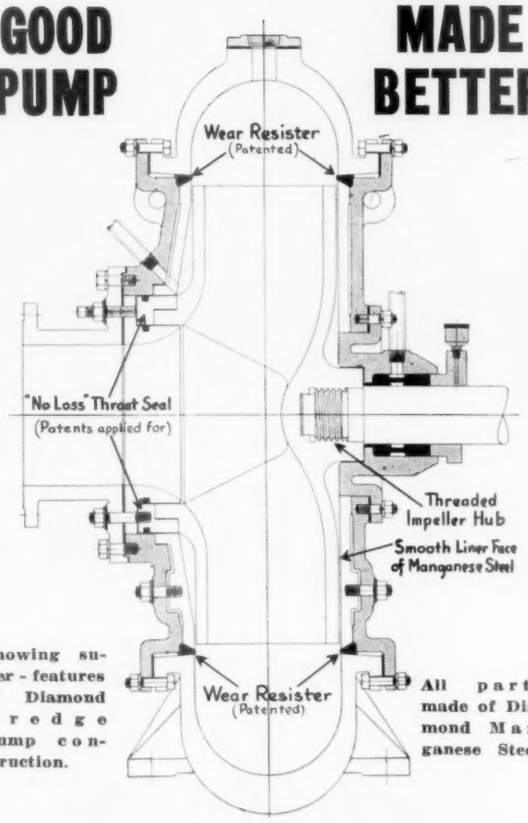
A GOOD PUMP NOW MADE BETTER



Showing super-features of Diamond Dredge Pump construction.

All parts made of Diamond Manganese Steel.

DIAMOND DREDGE PUMP

now give their users even better performance because of newly developed features. Operators can now produce material at a still lower cost. The patented "Wear Resister" protects pump shell, side plates and liners from wear at vital points. Threaded Impeller Hub or Bore gives greater impeller throat clearance and insures a true running impeller at all times. "No Loss" Throat Seal prevents internal leakage. P.M. Co. Products include Traveling Chain Cutter, Rotary Cutters, Elbows, Flap Valves, Nipples, Jaw Plates, Crusher Parts, Dippers, Dipper Teeth, Sheaves, and other Manganese Steel Products.

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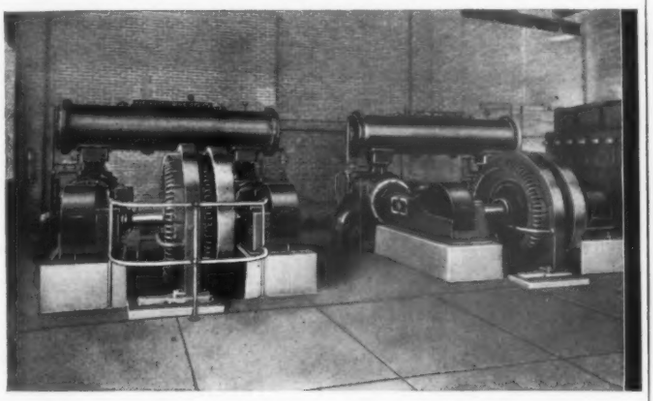
Single and two-stage designs; belt, direct-connected motor and steam drive; capacities up to 10,000 c.f.m.; special sizes also available.



Two CP Class O Air Compressors installed by a prominent cement company. Upon the basis of their outstanding performance, another CP Air Compressor of the same class has since been installed in the same plant.

noted for "repeat orders" Compressors that consistently earn the endorsement of "repeat" orders are the compressors that can . . . and will . . . deliver the lengthy, reliable, low cost service you seek.

CP Class O Compressors are noted for their record of "repeat" orders. Let us quote from that record . . . along with the interesting details of design, construction and operation given in Bulletins No. 724 and 725.

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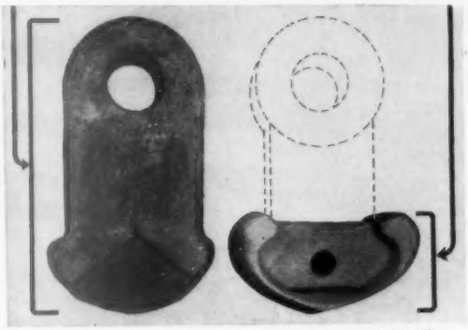

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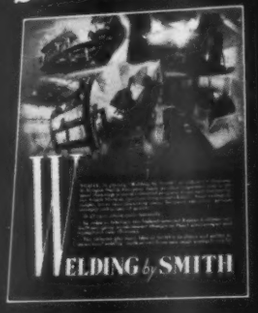

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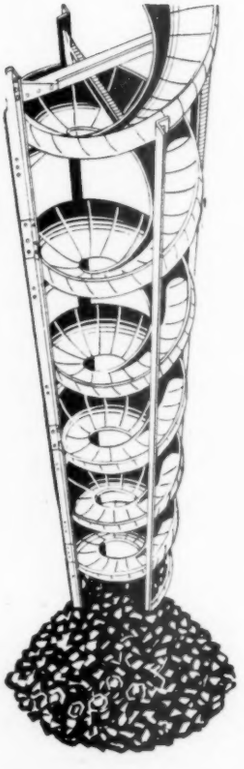
Every installation of spirals is tailor-made for the particular job. That's why it works so well wherever it is used. Let our engineers consult with you.



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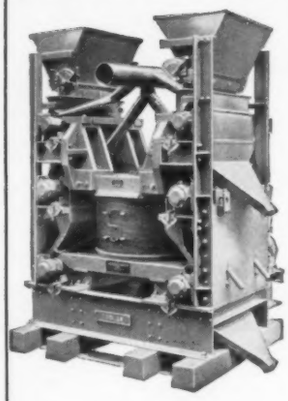
to Separate?



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THE EXOLON COMPANY BLASDELL, N. Y.

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for Joining and Repairing

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FLEXCO HD

BELT FASTENERS

RIP PLATES

U. S. Pat. 1,382,799

FLEXCO HD BELT FASTENERS make a tight butt joint of great strength and long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Five sizes in steel and alloys.

FLEXCO HD RIP PLATES are used in repairing rips and patching conveyor belts. The added width gives a desirable long grip on the edges of the rip. Consultation on belt joining and repair invited. Sold through jobbers and belting houses the world over.

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Stock Sold Through DISTRIBUTORS for ECONOMY Service

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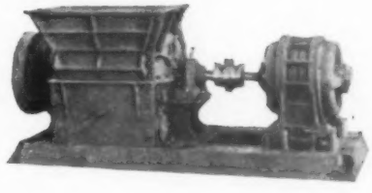
On the high speed 60 in. conveyors, handling up to 2,500 yards of rock and earth per hour, FLEXCO HD FASTENERS are used and FLEXCO HD RIP PLATES were developed. They have been the means of returning thousands of feet of ripped and punctured belting to satisfactory service.



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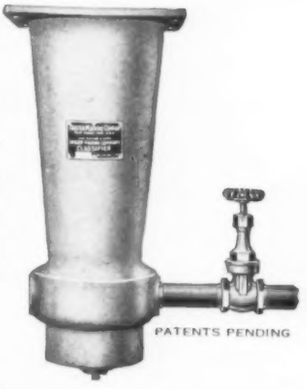

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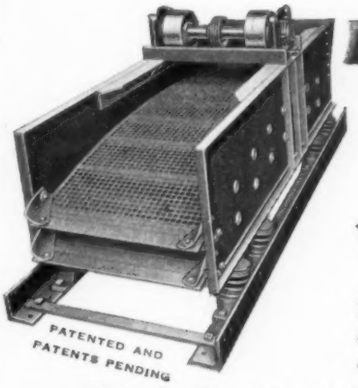

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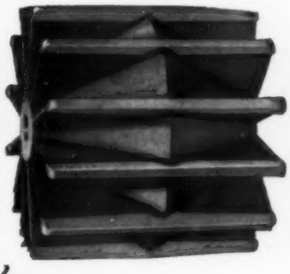

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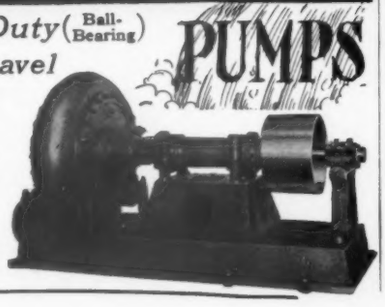

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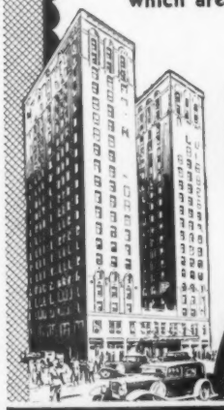

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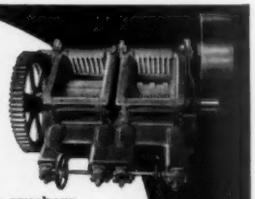

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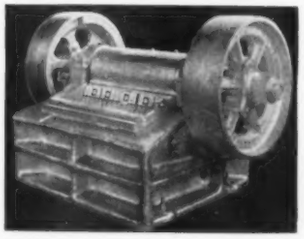

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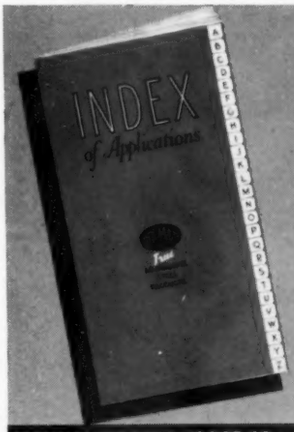

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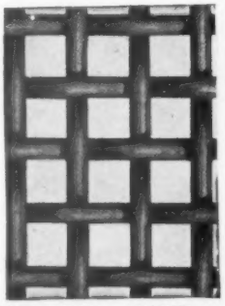

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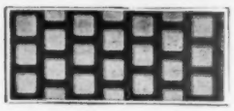
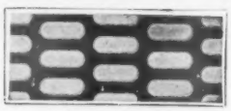
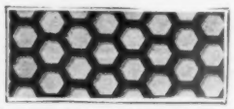
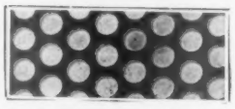

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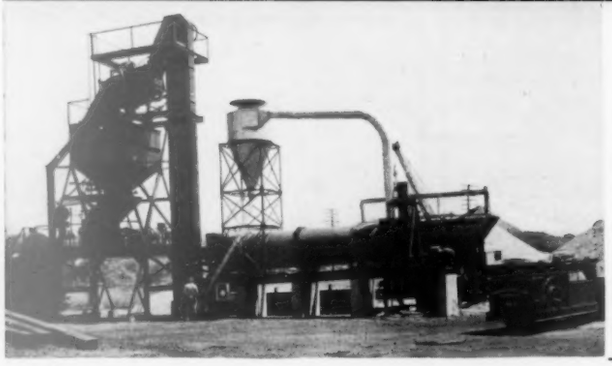

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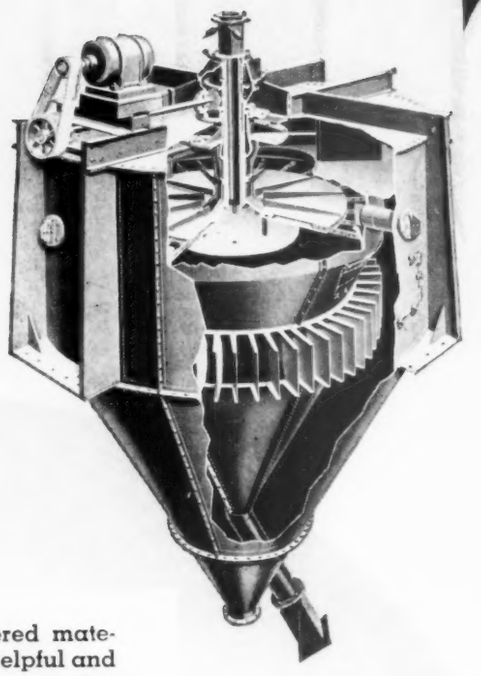

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